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THE AUSTRALIAN ANTS OF THE PONERINE TRIBE CERAPACHYINI.¹

BY WILLIAM MORTON WHEELER.

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THE Cerapachyini are of unusual interest to the myrmecologist, because they represent one of the most primitive sections of the most primitive subfamily of ants, the Ponerinæ, and because they are so closely related to the subfamily Dorylinæ as to suggest that the latter must have arisen from Cerapachyine ancestors. Owing, however, to the fact that all the species of the tribe are rare and sporadic and confined to warm countries, our knowledge of the habits and sexual forms of the species and of their distribution is still very inadequate. In a country like Australia which preserves such a large portion of the ancient Mesozoic ant-fauna, we should expect to find the tribe well represented in genera and species, and this proves to be true.

The workers of the Cerapachyini are easily recognized by their long, slender, jointed bodies; the petiole and postpetiole of the abdomen are distinct and in one of the genera (*Eusphinctus*) even the gastric segments are marked off from one another by pronounced constrictions. The eyes are often lacking, the antennæ are robust and well developed, the clypeus is very short and vertical, and the frontal carinæ are erect and closely approximated, so that the insertions of the antennæ are exposed. The thoracic sutures are very feeble or entirely absent. In the males the mandibles are well developed, the genital appendages are retracted and there are no cerci. The females are sometimes worker-like and apterous, though possessing eyes or both eyes and ocelli (*Nothosphinctus*, *Eusphinctus*); in other species the thorax has distinctly differentiated sclerites and bears wings, though the mesonotum and scutellum are very small; in still others the thorax has differentiated sclerites but bears no wings (*Cerapachys*, *Phyracaces*). The larva of only one species has been described, that of the Texan *Cerapachys* (*Parasyscia*) *augustæ* Wheeler (Psyche 1903, pp. 205-209). In the present paper I have sketched the larva

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of *Eusphinctus steinheili* Forel (Fig. 2). It is very long and slender, non-tuberculate and covered with bifurcate hairs. No pupæ of Cerapachyini have been seen, so that we are unable to say whether they are naked or enclosed in cocoons like the pupæ of all other Ponerinæ, except those of the genus *Discothyrea*.

Emery in the "Genera Insectorum" recognizes four genera of Cerapachyini, all of which are represented in Australia, namely, *Sphinctomyrmex*, *Cerapachys*, *Phyracaces* and *Lioponera*, the first comprising the subgenera *Sphinctomyrmex* s. str. and *Eusphinctus*, the second four subgenera: *Cerapachys* s. str., *Parasyscia*, *Oöceræa* and *Syscia*. Of the latter only *Syscia* is known to be represented in Australia. The taxonomic status of some of these groups is still doubtful, owing largely to incomplete information concerning their sexual phases. Emery (Zool. Jahrb. Abt. Syst. 8, 1895, p. 693, Pl. 14, Fig. 4) described and figured the genitalia of a male of an undetermined species of *Eusphinctus*, presumably from the Indomalayan region. He found that the inner paramera terminate as vertical plates with dentate inferior borders, and that the vosellæ are movably articulated, well differentiated and bear a vestigial lacinia at their bases. Of the males of the Australian species which have been included in the genus *Sphinctomyrmex*, nothing is known. Santschi has recently described a male ant from Africa as *S. rufiventris*, but its generic status seems to me to be open to doubt. The peculiarities of the females of the Australian forms have, in my opinion, an important taxonomic bearing, as will be evident from the following considerations.

The genus *Sphinctomyrmex* was erected by Mayr (Verh. zool. bot. Ges. Wien 16, 1866, p. 895, Pl. 20, Fig. 8) for the accommodation of a single deälated female specimen described from Brazil as *S. stâli*. During half a century no one has succeeded in again finding this insect. Mayr's figure shows that its thorax has well developed sclerites essentially like those in ordinary female ants. The antennæ are 12-jointed, the pygidium emarginate. In 1895 Emery erected a genus *Eusphinctus* for a worker ant (*E. furcatus*) from Lower Burmah, with 11-jointed antennæ, but with the pygidium emarginate and the gastric segments separated from one another by deep constrictions as in the Brazilian *stâli*. In 1897 a second species (*E. cribratus*) was described by Emery from New Guinea and Forel added a third from Bengal (*E. taylori*) in 1900. Only workers of these forms have come to light. In the meantime Forel received several species from Australia, some of which had 11-jointed, while others had 12-

jointed antennæ. He therefore concluded that *Eusphinctus* was merely a subgenus of *Sphinctomyrmex*. An examination of the Australian specimens convinced him that each colony of *Eusphinctus* contained two kinds of workers, one small and eyeless, the other large and possessing eyes and ocelli. As a somewhat similar dimorphism of the worker caste had been found in the European *Ponera eduardi*, he inclined to the view that the eyed individuals of *Eusphinctus* were gynæcoid workers, but he was baffled by these forms, which kept turning up, often in considerable numbers in colonies received from Australia. Later, in a species of what he regarded as *Sphinctomyrmex* s. str. (*S. imbecillis*) from South West Australia, he found a single large, eyeless individual, much like a worker, but more pilose, with more convex sides to the head and much larger gaster, more feebly constricted between the segments. This specimen he designated as an "ergatomorphic female" and noted its resemblance to the dichthadiigynes of the Dorylinæ on the one hand and to the large-eyed, shorter-headed and more pilose workers of *Eusphinctus* on the other, but confessed himself to be even more baffled in his attempts to interpret the personnel of colonies of Australian *Sphinctomyrmex*. In 1905 Ernest André (Rev. d'Ent. 24, 1905, p. 205) found the two types of individuals in a new species of *Eusphinctus* (*E. duchaussoyi*) from Sydney, N. S. W., and expressed the following opinion in regard to their meaning: "I consider the individuals with eyes and ocelli as ergatoid females and not as gynæcoid workers, although Forel inclines to the latter hypothesis so far as *E. steinheili* is concerned. My opinion is based on the fact that up to the present time no normal females have been found in any of the known species of the genus *Eusphinctus* and that probably such females do not exist but are replaced by ergatoids, a condition not without precedent in the ant-world. One may, of course, say by way of objection that the type of the genus *Sphinctomyrmex*, of which *Eusphinctus* is regarded as a subgenus, is based on a female with normal characters, but I would reply that its worker is still unknown, so that it is not certain that the described female, which is American, belongs to the same genus as the Asiatic and Australian species. I believe rather, till proof to the contrary is forthcoming, that the genus *Sphinctomyrmex* should be restricted to the single *S. stâli* of Brazil, which is the type, and that all the Asiatic and Australian species should constitute the genus *Eusphinctus* Emery, without distinction between those having 12 or 11 antennal joints. Besides such characters as may be exhibited by the still unknown worker of *Sphinctomyrmex*, this genus is characterized

by a normal female, whereas the female of *Eusphinctus* is ergatomorphic."

Emery in the "Genera Insectorum" (Fasc. 118, 1911, p. 6) adopted André's interpretation of the eyed individuals but not his suggestion to restrict *Sphinctomyrmex* to the Brazilian type and to place all the Old World forms notwithstanding the differences in the number of antennal joints in the genus *Eusphinctus*. My study has led me not only to adopt André's suggestion but to go even further. There are evidently not two, but three groups of subgeneric status among the Australian forms. One of these comprises a single species, *E. turneri* Forel, known only from the worker, which is large, black, with 12-jointed antennæ, well-developed eyes, but without ocelli and with an emarginate pygidium. The two other groups have blind workers with entire pygidium, but differ in the number of antennal joints, *Eusphinctus* s. str. having 11, and the other group 12 (*Sphinctomyrmex* s. str. of Emery and Forel). Now the following facts show that the females of these two groups, though like the workers in form, differ in size and in the visual organs and shape of the pygidium:

1. No workers or worker-like individuals with well-developed eyes and ocelli are known in the group with 12-jointed antennæ (with the possible exception of *S. myops* Forel, which may be a female!).

2. An "ergatomorphic female" of *S. imbecillis* was described by Forel as being considerably larger than the worker, without eyes or ocelli, with scarcely constricted gastric segments and with emarginate pygidium.

3. Dr. W. M. Mann loaned me for study a fine colony of a new species closely related to *imbecillis*, which he recently discovered in New South Wales (*manni* sp. nov.). This colony comprises 227 blind workers varying from 3 to 5 mm. in length, and a single much larger, worker-like individual 7 mm. in length, with very minute eyes and the anterior ocellus, but in all other respects, except the somewhat larger size, like the ergatomorphic female of *imbecillis* described by Forel. Even in the field Dr. Mann at once recognized this individual as the queen of the colony.

4. In the known Australian species of *Eusphinctus* s. str. each colony contains several large, eyed and ocellate worker-like individuals. Since these individuals differ from the blind workers in many of the characters exhibited by the ergatomorphic females of *imbecillis* and *manni* (greater size and more voluminous gaster, shorter and laterally more convex head, more abundant pilosity), André's and Emery's view that they are the only true females among these ants, seems to

me more acceptable than Forel's supposition that we are here concerned with a peculiar dimorphism of the worker caste comparable with that observed in *Ponera eduardi*.² The colonies referred to *Eusphinctus* s. str. are polygynic whereas those referred to *Sphinctomyrmex* s. str. by Emery and Forel are monogynic, a difference naturally correlated with the size and development of the gaster in the females of the two groups. Since the reproductive function is distributed over several queens in *Eusphinctus*, each is more nearly of the normal stature of the largest workers than in the *Sphinctomyrmex* colony.

I therefore agree with André in leaving only *S. stål*i of Brazil in the genus *Sphinctomyrmex* and in regarding all the paleotropical species as belonging to the genus *Eusphinctus*, but believe that the latter should be divided into at least three subgenera, as follows:

1. *Eusphinctus* s. str. Workers and females with 11-jointed antennæ, with entire or emarginate pygidium, the workers blind, the females with eyes and ocelli. Habits hypogæic.

2. *Nothosphinctus* subgen. nov. Workers and females with 12-jointed antennæ; the former blind and with entire pygidium, the latter with emarginate pygidium and either blind or with very minute eyes and the anterior ocellus. Habits hypogæic.

3. *Zasphinctus* subgen. nov. Workers large, dark colored, with 12-jointed antennæ and well developed eyes, but without ocelli. Females unknown. Habits probably epigæic.

The worker of *E. cribratus* Emery of New Guinea has an entire pygidium and belongs with the Australian species in *Eusphinctus* s. str. but the workers of the Indian species *E. furcatus* Emery and *taylori* Forel have a notched pygidium. Should future investigation show that the pygidial characters are correlated with other peculiarities or with different types of female, it may be advisable to restrict the subgenus *Eusphinctus* to the two Indian species and to suggest a

² Cases of dimorphism of the worker among the Ponerinæ are extremely rare. The most remarkable case is that of the African *Megaponera fâtens* Fabr., which has two types of workers differing not only in size, but also in sculpture and the structure of the antennæ. As no winged females were known of this species Emery believed that their place in the colonies was usurped by the large workers but Arnold has recently discovered and described the true female (Ann. South Afr. Mus. 14, 1915, p. 48 *nota*, Fig. 6). It is ergatoid and therefore resembles the females of *E. manni* and *imbecillis*. Among many specimens of *M. fâtens* recently collected in the Congo by Mr. H. O. Lang of the American Museum of Natural History I find both forms of worker in each colony.

new subgeneric name for the Australian and Papuan forms with 11-jointed antennæ.

In this connection attention may be called to the fact that the females of *Nothosphinctus* bear a surprising resemblance to those of the related tropical genus *Acanthostichus*, as will be seen by consulting Emery's description and figures of the female of *A. quadratus* (Zool. Jahrb. Abt. Syst. 8, 1895, p. 693, Pl. 14, Fig. 4 and Gen. Insect. Fasc. 118, 1911, Pl. 1, Figs. 4 and 4b). As Emery and Forel have remarked, these females resemble the only known females of the Dorylinæ (*Dorylus*, *Eciton*, *Aenictus*, *Leptanilla*) and may therefore have considerable phylogenetic significance. In previous publications I have described similar females in several Ponerine genera (*Onychomyrmex*, *Paranomopone*, *Leptogenys*).³

Turning to the other genera of the Cerapachyini we find that our knowledge of the females is even more incomplete than in *Sphinctomyrmex* and *Eusphinctus*. The female *Cerapachys imerinensis* Forel of Madagascar has well-developed wings and *Phyracaces pubescens* Emery of Borneo and *Ph. turneri* Forel of Queensland were described from dealated females, and I have winged females of an undescribed *Phyracaces* from the Congo, but the females of *Parasyscia augustæ* Wheeler and *Phyracaces elegans* sp. nov. show no traces of having borne wings, though the thorax is of the same structure as in the winged females. The same is true of the female of an undescribed species of *Syscia* recently taken in Fiji by Dr. W. M. Mann. In the Indian *Lioponera longitarsis* the female is ergatoid. These genera therefore exhibit various stages in the reduction of the normal winged female to the ergatoid type of *Eusphinctus* s. str. while *Nothosphinctus*

³ Consistency with the views here advanced would require that *Ctenopyga* Ashmead should be regarded as a distinct genus and not as a subgenus of *Acanthostichus*, since the females of the two known species, *C. texanus* Forel and *C. townsendi* Ashmead, are winged and quite different from that of *A. quadratus*. A too consistent following of the example of André and myself would, however, lead to difficulties in such cases as the European *Harpagoxenus sublaevis*, an ant which in Sweden has only apterous, ergatoid females, but in Saxony has winged females of normal structure. I have perhaps over-emphasized the differences between the paleotropical *Eusphinctus* and the neotropical *Sphinctomyrmex*, but my procedure may at least deter zoögeographers from citing *Sphinctomyrmex* as evidence of a former antarctic land connection between South America and Australia. It is often just such imperfectly known genera, which are confidently cited in support of ancient land-bridges; e. g. the genera *Myrmecocystus* and *Melophorus*. When carefully studied the Old World forms referred to *Myrmecocystus* are seen to be generically distinct and are now referred to *Cataglyphis*, while the South American forms referred to *Melophorus* really belong to a distinct genus, *Lasiophanes*.

may be said to show an early stage in the development of the dichthadiigyne of the Dorylinæ.

The distribution of the 75 known species of Cerapachyinae is given in the following table:

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Hawaiian	Neotropical
<i>Sphinctomyrmex</i>							1
<i>Eusphinctus</i>	1		2	1	2		
<i>Nothosphinctus</i>					7		
<i>Zasphinctus</i>					1		
<i>Cerapachys</i>	6	1	9	2			
<i>Parasyscia</i>			2				2
<i>Oöceraea</i>			2				
<i>Syscia</i>			2	2	1	1	
<i>Phyracaces</i>	4	2	2	1	16		
<i>Lioponera</i>	2		2		1		
Total	13	3	21	6	28	1	3

It will be seen that Australia has many more species than any other region, that the genus *Phyracaces* is especially well represented and that only four of the ten genera and subgenera are absent. One of these, however, *Cerapachys* s. str., occurs in New Guinea and will therefore probably be found in Northern Queensland. The present center of distribution of the whole group, with 50 species, representing all the genera except *Sphinctomyrmex*, is seen to cover the Indo-malayan, Papuan and Australian regions. That the group was once cosmopolitan in range is shown by the survival of *Sphinctomyrmex stål*i in Brazil, *Parasyscia augustæ* Wheeler in Texas and *P. tolteca* Forel in Guatemala and by the occurrence of two large primitive Cerapachyine forms (*Procerapachys annosus* Wheeler and *P. favosus* Wheeler) in the Baltic Amber.

A difference of opinion has arisen between Emery and Forel in regard to the status of *Phyracaces*, the former now regarding it as a distinct genus, the latter as a subgenus of *Cerapachys*. While the distinctive characters of *Phyracaces*, namely the less pronounced

development of the terminal antennal joint, the large eyes and the sharp lateral border of the petiole and often also of the postpetiole, are minor characters, they seem to be sufficiently constant to enable one to separate the species readily from those of *Cerapachys* and its subgenera. Moreover, at least the great majority of species of *Cerapachys* sens. lat. are hypogæic, whereas those of the genus *Phyracaces* forage on the surface of the ground.

Some meager notes on *Parasyscia augustæ* which I published many years ago, have remained up to the present time the only account of the habits of a Cerapachyine ant. During my sojourn in Australia I was able to gain a few additional glimpses of the behavior of one species of *Eusphinctus* and of several species of *Phyracaces*. My brief field notes on these insects may be here transcribed:

Nov. 30, 1914, I found a fine colony of *Eusphinctus steinheili* under a large log which was rather deeply embedded in sand in the bottom of a ravine at Hornsby, New South Wales. The colony, which comprised about 200 workers and females, was crowded into a few small burrows in the sand, with a large number of nearly full-grown larvæ. Dr. Mann found three smaller colonies of this species during December, 1916, at Leura in the Blue Mts., Sydney and Wentworth Falls, N. S. W. One of these also contained adult larvæ but no pupæ.

Sept. 16, at Southerland, New South Wales, I found a colony of about 70 workers and one wingless female of *Phyracaces elegans* sp. nov. huddled together in a mass under a block of sand-stone in a thin layer of soil which in turn was lying on the hard sandstone wall of one of the deep gorges so characteristic of the country about Sydney. As there was no brood in the colony and as it had rained heavily the preceding day, I inferred that the ants were merely bivouacking after having been washed out of their nest.

Sept. 19, a fine colony of about 50 workers of *Phyracaces larvatus* sp. nov. was found under a small stone in one of the deep sandstone ravines near Katoomba in the Blue Mts. of New South Wales.

Oct. 18. Near Cairns, Queensland, I happened on about a dozen workers of *Ph. ferridus* sp. nov. running rapidly over a patch of sand in the open forest. They moved much like workers of *Lobopelta*. Two of them entered a nest of *Pheidole* but soon returned to the surface and continued foraging.

Oct. 19. A few workers of *Ph. turneri* Forel were seen running about on dead leaves in the dark, tropical "scrub" at Kuranda, Queensland. The nest was not discovered.

Oct. 25. In the same locality and also in the tropical "scrub" I

found a colony of about 25 workers of *Ph. binodis* Forel in a small cavity of a damp, red-rotten log.

Nov. 10. I found several workers of *Ph. scrutator* sp. nov. foraging under a stone in a dry depression at the base of the mountain at Toowong, near Brisbane, Queensland. The ants moved rapidly and seemed to be searching for the nests of other ants.

Nov. 26. At Salisbury Court, near Uralla, New South Wales, I saw a fine colony of *Ph. senescens* sp. nov. comprising about 150 workers running rapidly about on a hill-slope, very evidently on a foraging expedition. They reminded me of the small forays of *Formica sanguinea* in northern regions.

Dec. 3. In the Bulli Pass, New South Wales I came upon a dozen workers of *Ph. ficosus* sp. nov. running over the sand in a very loose file. Three or four of them were carrying the naked pupæ of some small Myrmicine ant in their jaws.

These observations show that, as I maintained in the case of *Parasyscia augustæ*, the *Cerapachyini* form small colonies, like most species of Ponerinæ, that the species of *Eusphinctus* (with the probable exception of *S. turneri*) are hypogæic in their habits, a peculiarity also indicated by the absence of eyes in the workers of nearly all the species and the small eyes of the females, and that the large-eyed *Phyracaces* forage in troops (or as whole colonies?) on the surface of the ground, their prey consisting of the brood of other ants. These facts are very significant in connection with the affinities of the Cerapachyini to the Dorylinæ, or driver ants, which in Africa and tropical America, forage in a similar manner, though in much larger companies, because their colonies are much more populous, and also feed on the brood of other ants when other insect food is not available. Still, what I have seen are only glimpses of the habits of the Cerapachyini. Any of my fellow entomologists in Australia who will undertake an intensive study of these ants will, I am sure, find many new and interesting ethological traits and solve many problems relating to the character of the sexual phases, in addition to finding many new forms, since practically every colony of *Phyracaces* I saw, during the limited time at my disposal, represented a different, undescribed species. In addition to the material collected by myself I have been able, through the kindness of Mr. A. M. Lea, to study the Cerapachyinae of the Museum of South Australia, comprising specimens of *Eusphinctus steinheili* and its var. *hedwigæ*, *Zasphinctus turneri*, *Phyracaces heros*, *leæ*, *rugulinodis* and *mullewanus*. Mr. Henry Hacker of the Queensland Museum has presented me with specimens of *Eusphinctus hackeri* and *Syscia australis*.

The four genera of Cerapachyini occurring in Australia may be readily distinguished as follows:

1. Gaster elongate, cylindrical, the segments separated from each other by pronounced constrictions.....*Eusphinctus* Emery.
Segments of the gaster not thus separated.....2.
2. Last antennal joint much thicker and larger than the preceding joint, forming a one-jointed club; petiole not marginate on sides
Cerapachys F. Sm.

- Last antennal joint not enlarged, though longer than the preceding joint, and not forming a distinct club.....3.
3. Funiculus of antenna terminating in a 4-jointed club
Lioponera Mayr.

Funiculus not terminating in a 4-jointed club; petiole marginate on sides.....*Phyracaces* Emery.

The subgenera of Cerapachys are easily distinguished by the number of antennal joints, *Cerapachys* s. str. having 12, *Parasyscia* 11, *Oöceræa* 10 and *Syscia* 9 joints.

Genus **Eusphinctus** Emery.

The workers and females of the subgenera, species and varieties of *Eusphinctus* may be separated by the following dichotomy:

1. Antennæ 11-jointed (Subgen. *Eusphinctus*).....2.
Antennæ 12-jointed.....6.
2. Length 3.2-4 mm.....3.
Length not more than 3 mm.....4.
3. At least the head, thorax and petiole ferruginous brown; sides of postpetiole straight.....*steinheili* Forel.
Color uniformly reddish; sides of postpetiole convex.
var. *hedwigi* Forel.
4. Length only 1.5 mm.....*hackeri* sp. nov.
Length 2.5-3 mm.....5.
5. Pale ferruginous, head, thorax and petiole infuscated above; female with rather large, flat eyes.
steinheili var. *duchaussoyi* Ern. André.
Pale yellowish red; female with minute eyes...var. *cedaris* Forel.
6. Large black species, 7-8.5 mm. long; worker with well developed eyes and emarginate pygidium (Subgen. *Zasphinctus* subgen. nov.).....*turneri* Forel.
Smaller, ferruginous or yellow species; worker eyeless or with

- very minute eyes, pygidium entire (Subgen. *Nothospinctus* subgen. nov.).....7.
7. Workers with minute eyes.....*myops* Forel.
Workers without eyes.....8.
8. Postpetiole concave in front.....*emeryi* Forel.
Postpetiole not concave in front.....9.
9. Head square, hardly longer than broad, thorax flattened above,
marginate in front.....10.
Head distinctly longer than broad; thorax at most submarginate
in front.....11
10. Mandibles punctate and coarsely striate; thorax only twice as
long as broad; epinotal declivity marginate above and on the
sides; petiole distinctly broader than long; head and thorax
coarsely punctate.....*froggatti* Forel.
Mandibles merely punctate; thorax $2\frac{1}{2}$ times as long as broad;
epinotal declivity marginate only on the sides; petiole scarcely
broader than long; head and thorax finely punctate.
imbecillis Forel.
11. Funicular joints 2-6 only slightly broader than long.
clarus Forel.
Funicular joints 2-6 much broader than long.....12.
12. Last antennal joint scarcely longer than the two preceding joints
together.....*mjöbergi* Forel.
Last antennal joint fully as long as the three preceding joints
together.....*manni* sp. nov.

1. **Eusphinctus** (**Eusphinctus**) **steinheili** Forel.

(Figs. 1 and 2.)

Sphinctomyrmex (*Eusphinctus*) *steinheili* Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 72, ♀ (nec ♂); Emery, Gen. Insect. Fasc. 118, 1911, p. 7.

Sphinctomyrmex steinheili Froggatt, Agric. Gaz. N. S. W., 1905, p. 15.

Sphinctomyrmex (*Eusphinctus*) *fallax* Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 73 ♂; Emery, Gen. Insect. Fasc. 118, 1911, p. 7.

Sphinctomyrmex fallax Froggatt, Agric. Gaz. N. S. W., 1905, p. 15.

Worker. Length 3.2-3.6 mm.

Head nearly $1\frac{1}{2}$ times as long as broad, as broad behind as in front, with very feebly convex sides, broadly excavated posterior border and short but rather pointed posterior corners. Occipital border

strongly marginate, the margination running around the posterior corners and along the ventral surface on each side about $\frac{1}{3}$ the length of the head. Eyes and ocelli absent. Mandibles small, abruptly flexed at their bases, with deflected blades, the apical margins very indistinctly denticulate. Clypeus very short. Frontal carinæ closely approximated, in front surrounding the antennal insertions, behind fused and truncated in a depression which unites the antennal foveæ. Carinæ of cheeks sharp, abruptly and angularly turned inward behind towards the antennal foveæ. Antennæ robust; scapes about half as long as the head, thickened apically; first funicular joint as long as broad; joints 2-9 broader than long, apical joint enlarged, glandiform, as long as the four preceding joints together. Thorax about $2\frac{1}{2}$ times

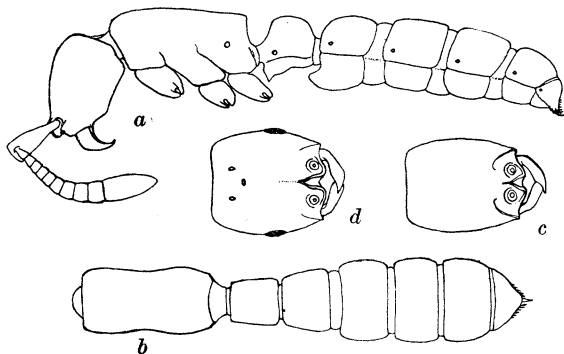


FIGURE 1. *Eusphinctus steinheili* Forel, *a*, worker in profile; *b*, thorax and abdomen of same, dorsal view; *c*, head of same, *d*, head of female.

as long as broad, its dorsal surface flattened, with a very feeble transverse depression marking the obsolete mesoëpinal suture; epinotum abruptly truncated behind, distinctly concave in profile; pronotum marginate in front; epinotal declivity sharply marginate on the sides and above, on each side above very feebly subdentate. Mesopleuræ rather concave. Petiole from above rectangular, distinctly longer than broad, scarcely broader behind than in front, narrower than the epinotum, with straight, subparallel sides, rather rounded, convex dorsal surface and a sharp, angular tooth, directed forward and downward on its anteroventral surface. Postpetiole broader than the petiole, as long as broad and distinctly broader behind than in front, with straight sides and anterior border, its ventral portion in front

very protuberant and rounded. First gastric segment $1\frac{1}{2}$, second and third segments twice as broad as long. Pygidium subtruncate behind, on each side and at the blunt tip minutely spinulate. Legs moderately long.

Shining; mandibles coarsely punctate; head, thorax and petiole covered with rather shallow, umbilicate, piligerous foveolæ, which are dense on the head and distinctly sparser on the thorax and petiole. Postpetiole and gaster evenly punctate.

Hairs pale yellow, slender, pointed, moderately long, suberect on the body, partly appressed and like long pubescence on the gaster.

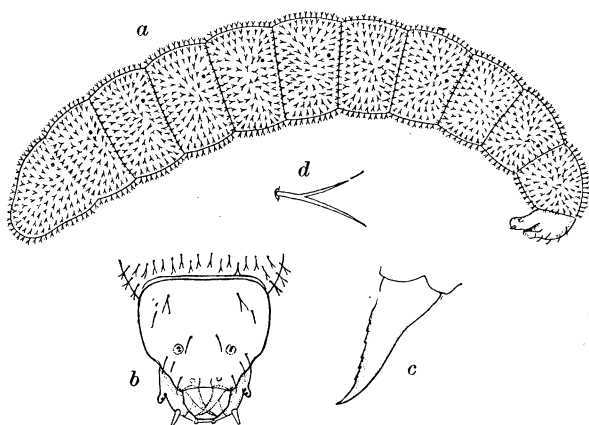


FIGURE 2. *a*, Larva of *Eusphinctus steinheili* Forel, lateral view. *b*, head of same, dorsal view; *c*, mandible; *d*, forked hair from body enlarged.

Antennæ and legs with very few erect hairs, but covered with rather abundant, appressed pubescence.

Ferruginous brown; mandibles, cheeks, antennæ, legs, postpetiole and gaster paler and more reddish.

Female. Length 3.5–4 mm.

Differing from the worker in its large size, in the proportionally broader head, which is scarcely $1\frac{1}{4}$ times as long as broad, the less distinct carinæ on the cheeks and the presence of eyes and ocelli, the eyes being moderately large, rather flat and placed a little in front of the middle of the sides of the head. The petiole is not longer than broad, the gaster more voluminous, with the constrictions between the segments less pronounced than in the worker. The erect hairs

on the body and appendages are longer, more abundant and more bristly, even on the antennal funiculi. The appressed hairs on the gaster are also longer and more numerous.

Larva. Long and slender, cylindrical and not enlarged at the posterior end, with eleven distinct postcephalic segments, all uniformly clothed with short, erect, two-branched hairs. Head small, as broad as long, with vestigial antennæ and long falcate mandibles, which have finely serrate internal borders. There are few hairs on the head and these are simple, with the exception of a pair near the occipital border, which are two-branches like those on the body. The color of the larva is dull white.

Queensland: Mackay, type-locality (Turner).

New South Wales: Hornsby (Wheeler); Sydney, Wentworth Falls and Leura, Blue Mts. (W. M. Mann).

South Australia: Lucindale (Feuerheerdt).

I have examined a cotype of *steinheili* given me by Prof. Forel. It is indistinguishable from the females in the colonies I have seen from New South Wales and South Australia, the workers of which are evidently referable to Forel's *fallax*. The nests are found in sand under logs and stones.

2. *Eusphinctus* (*Eusphinctus*) *steinheili* var. *hedwigæ* Forel.

Sphinctomyrmex (*Eusphinctus*) *fallax* subsp. *hedwigæ* Forel, Rev. Suisse Zool. 18, 1910, p. 21 ♂ ♀; Emery, Gen. Insect. Fasc. 118, 1911, p. 7; Boll. Lab. Zool. Gen. Agrar. 8, 1914, p. 179.

Sphinctomyrmex hedwigæ (sic!) Froggatt, Agric. Gaz. N. S. W., 1905, p. 15.

New South Wales: Walcha, type locality (W. W. Froggatt).

South Australia: Mt. Lofty (Silvestri; A. M. Lea); Adelaide (Mus. S. Austr.).

I am convinced from examination of a cotype worker and female and of many specimens of both phases from the two localities in South Australia that this is merely a variety of *steinheili*. The postpetiole has the sides more rounded in the worker than in the typical form of the species, but both this character and the width of the gastric segments of the two forms are somewhat variable, so that often they can be distinguished only by the coloration, *hedwigæ* having the body more uniformly reddish.

3. **Eusphinctus** (**Eusphinctus**) **steinheili** var. **duchaussoyi**
Ern. André.

Eusphinctus duchaussoyi Ern. André, Rev. d'Ent., 1909, p. 205, ♂ ♀.
Sphinctomyrmex (*Eusphinctus*) *duchaussoyi* Emery, Gen. Insect.
Fasc. 118, 1911, p. 7.

New South Wales: Sydney (A. Duchaussoy).

Judging from André's description this form, too, is hardly more than a variety of *steinheili*. It is distinctly smaller, the worker measuring only 2.5–3 mm., the female 2.7–3 mm. The color is paler as in *hedwigæ* and the punctures are different, being described as sparse and a little larger and less abundant on the head and thorax and finer and denser on the abdomen.

4. **Eusphinctus** (**Eusphinctus**) **steinheili** var. **cedaris** Forel.

Sphinctomyrmex (*Eusphinctus*) *fallax* var. *cedaris* Forel, Ark. f. Zool. 9, 1915, p. 16, ♂ ♀.

Queensland: Cedar Creek (E. Mjöberg).

Of about the same size as *duchaussoyi*, the worker measuring 2.5–2.6 mm., the female 2.9 to 3.1 mm. The petiole of the worker is more steeply truncate in front below than in *steinheili*, the punctures are sharper and denser on the abdomen, but feebler and sparser on the head. In the female the eyes are smaller, consisting of only about 8 or 9 indistinct facets.

5. **Eusphinctus** (**Eusphinctus**) **hackeri** sp. nov.

(Fig. 3.)

Worker. Length 1.5–1.7 mm.

Head rectangular, fully $1\frac{1}{2}$ times as long as broad, as broad behind as in front, with straight, parallel sides, rather deeply excised posterior border and short, blunt posterior corners. Occipital border marginate. Eyes and ocelli absent. Mandibles not abruptly flexed at the base, their apical and basal borders not distinctly separated, the former minutely denticulate. Frontal carinae approximated, surrounding the antennal insertions in front, confluent behind and truncated in a depression connecting the antennal foveae. Carinae of cheeks short and indistinct. Antennae robust; scapes about $\frac{1}{3}$ as long as the head,

much thickened apically, first funicular joint as long as broad, joints 2-9 very transverse, terminal joint large, glandiform, fully as long as the five preceding joints together. Thorax about $2\frac{1}{2}$ times as long as broad, with flattened dorsum, rounded humeri and epinotal angles, as broad behind as in front, with very feebly indicated mesoëpinotal suture. Pronotum not marginate, epinotal declivity marginate only on the sides, in profile truncated and decidedly concave. Petiole narrower than the epinotum, rectangular, a little longer than broad and a little broader behind than in front, its dorsal surface convex, its anteroventral surface with a small, acute tooth. Postpetiole rectangular, broader than the petiole, as broad as long, a little broader behind than in front, with straight sides. Gastric segments 1-3

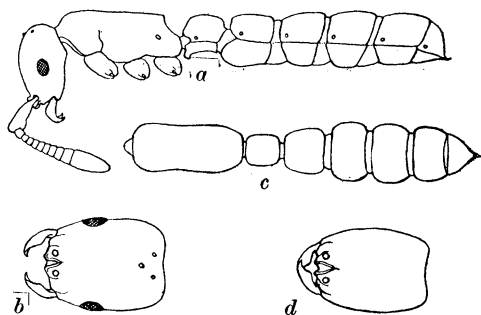


FIGURE 3. *a*, Female *Eusphinctus hackeri* sp. nov., lateral view; *b*, head of same, dorsal view; *c*, thorax and abdomen of worker, dorsal view; *d*, head of same.

nearly twice as broad as long. Pygidium short, broadly rounded and truncate behind, where it is bordered with minute spinules.

Shining; mandibles coarsely punctate; head, thorax, petiole and postpetiole covered with umbilicate, piligerous foveolæ, which are densest on the upper surface of the head, elongate on its front and sides; gaster rather coarsely and evenly punctate. Antennal scapes sparsely foveolate.

Hairs pale yellow, short, erect, moderately abundant, longer at the tip of the gaster; pubescence dilute. Legs with fine, dilute, appressed pubescence and a very few, erect hairs.

Uniformly brownish yellow, not infuscated.

Female. Length 1.8 to 2 mm.

Differing from the worker in size and in having eyes and ocelli, the

former distinctly in front of the middle of the head, the broader and more rounded petiole and more voluminous gaster, with less pronounced constrictions between the segments. The sides of the postpetiole are straight as in the worker. The erect hairs on both the body and appendages are distinctly more abundant and more bristly.

Described from six workers and two females taken by Mr. Henry Hacker on Bribie Island, near Brisbane, Queensland.

This species is easily recognized by its very small size, rounded humeri and epinotal corners and the absence of marginations on the pronotum and upper portion of the epinotal declivity.

6. **Eusphinctus (Zasphinctus) turneri** Forel.

(Fig. 4.)

Sphinctomyrmex turneri Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 70, ♀; Rev. Suisse Zool. 18, 1910, p. 21, ♀; Froggatt, Agric. Gaz. N. S. W., 1905, p. 15; Emery, Gen. Insect. Fasc. 118, 1911, p. 7, Pl. 1, Fig. 1, ♀.

Worker. Length 7–8.5 mm.

Head subrectangular, a little longer than broad, as broad in front as behind, broadest through the eyes, which are moderately large and convex and a little in front of the middle of the sides; occipital border deeply and broadly excavated, marginate, the margin surrounding the posterior corners and extending forward on the gular surface about $\frac{1}{3}$ the length of the head. Ocelli absent. Carinæ of cheeks distinct but not dentate, running backward and inward towards the antennal foveæ. Mandibles rather small, subtriangular, deflected, their apical margins indistinctly denticulate. Clypeus short, with straight anterior border. Frontal carinæ short, erect, rounded, approximated and strongly truncated behind, surrounding the antennal insertions in front. Antennæ rather long, 12-jointed; scapes about $\frac{2}{3}$ as long as the head; funicular joints 1 and 5–10 distinctly broader than long, joints 2–4 as long as broad, terminal joint but slightly enlarged, as long as the three preceding joints. Thorax less than twice as long as broad, a little broader behind than in front, with rounded anterior and posterior corners, marginate anterior and prosternal borders, very feebly convex dorsal and slightly concave mesopleural surfaces, without promesonotal or mesoëpinotal sutures. The truncated surface of the epinotum is surrounded above and on the sides by a sharp

margination. Petiole as long as broad, rounded-cuboidal, slightly broader behind than in front, distinctly narrower than the epinotum, in profile higher than long, rounded above, with vertical, truncated anterior and posterior surfaces and a powerful triangular tooth at the anteroventral end. Postpetiole broader than the petiole, a little broader behind than in front, with rectangular anterior corners, convex dorsal surface and its anterior ventral portion rounded and strongly protuberant. Gastric segments 1-3 broader than long, separated by very deep and broad constrictions. Pygidium trape-

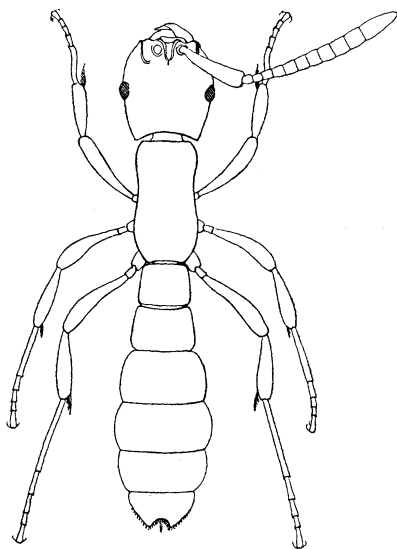


FIGURE 4. *Zasphectus turneri* Forel. Worker.

zoidal, flattened or slightly concave above, submarginate on the sides and rather deeply notched at the tip, the sides and notch fringed with conspicuous spinules. Sting robust, curved. Legs rather long, posterior coxæ without lamellate appendages.

Opaque; mandibles shining, coarsely punctate; head and thorax covered with round foveolæ, varying in size, their bottoms opaque and finely rugulose. These foveolæ are so close together that the spaces between them form coarse but not prominent reticulate rugæ. Remainder of body, including the legs and scapes coarsely and densely

punctate. Epinotal declivity shining, very finely and transversely shagreened.

Hairs grayish yellow, abundant and rather long, in part suberect, both on the body and appendages, and in part appressed, the latter appearing on the appendages as long pubescence.

Black; tarsi, articulations of legs, antennal funiculi, mandibles, clypeus, frontal carinæ, cheeks and pygidium reddish.

Queensland: Mackay, type-locality (Gilbert Turner); Kuranda (Rowland Turner and F. P. Dodd).

I have redescribed this species from four specimens from Kuranda, two received from Prof. Forel and taken by Rowland Turner and two taken by F. P. Dodd and belonging to the Museum of South Australia.

E. turneri is readily recognized by its large size, black color, the presence of eyes and the emarginate pygidium.

7. **Eusphinctus (Nothosphinctus) froggatti** Forel.

(Fig. 5.)

Sphinctomyrmex froggatti Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 71, ♀; Froggatt, Agric. Gaz. N. S. W., 1905, p. 15; Emery, Gen. Insect. Fasc. 118, 1911, p. 7.

Worker. Length 4.5–5.5 mm.

Head nearly square when seen from above, scarcely longer than broad, as broad in front as behind, with feebly rounded sides, deeply excavated posterior border and sharp posterior corners. Margination of posterior border and corners continued forward on each side of the gula fully $\frac{2}{3}$ the length of the head. Mandibles strongly flexed inward at the base, with distinctly concave external border, the apical border denticulate and passing through a curve into the basal border. Clypeus very short, its anterior border broadly rounded. Frontal carinæ very short, erect, small, approximated, fused and strongly truncated behind and curving around the antennal insertions in front. Antennal foveæ confluent behind the frontal carinæ. Cheeks with small, indistinct carinæ, which border the antennal insertions on the sides. Antennæ short and stout; scapes about half as long as the head, thickened towards their tips; funicular joints 1–9 short, very distinctly broader than long, tenth joint as broad as long, terminal joint fully as long as the three preceding joints together. Thorax subrectangular, fully twice as long as broad, as broad through

the pronotum as through the epinotum, with blunt anterior and posterior corners, flattened above and on the sides, which are scarcely submarginate, with sloping, concave, epinotal declivity. Mesoëpinotal suture very feebly indicated. Pronotum in front, prosterna, sides and upper border of epinotal declivity marginate. Petiole rounded cuboidal, as long as high, a little broader than long and a little broader behind than in front, its anterior surface flat and marginate on the sides; its ventral surface in front with a large, blunt, compressed tooth. Postpetiole fully $1\frac{2}{3}$ times as broad as long, broader than the petiole, broader behind than in front, with rounded anterior angles, and its ventral portion in front swollen and strongly protuberant. Pygidium flattened above, entire and blunt at the tip, with a row of

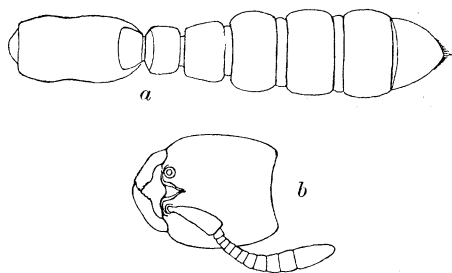


FIGURE 5. *a*, *Nothosphinctus froggatti* Forel, thorax and abdomen of worker, dorsal view; *b*, head of same.

spinules along each side. Legs moderately long; hind coxæ without lamellate appendage at the tip.

Shining; mandibles coarsely punctate, striate at the base; head, thorax, petiole and postpetiole covered with scattered foveolæ of varying size, denser on the head, very sparse in the mid-dorsal line of the thorax and on the petiole and postpetiole; gaster very finely shagreened and sparsely punctate.

Hairs pale yellow, short, moderately abundant, oblique or subappressed, shorter and more appressed on the appendages where they may be described as long; pubescence rather abundant, especially on the tibiæ.

Brownish red; scapes and legs somewhat paler; mandibles, anterior border of head and incisures of funicular joints blackish.

New South Wales: Minto, type locality (W. W. Froggatt); Sydney (A. M. Lea).

Redescribed from four specimens from the latter locality (Museum of South Australia).

8. **Eusphinctus (Nothosphinctus) emeryi** Forel.

Cerapachys emeryi Forel, Ann. Soc. Ent. Belg. 37, 1893, p. 461, ♀.

Sphinctomyrmex emeryi Froggatt, Agric. Gaz. N. S. W. 1905, p. 15;

Emery, Gen. Insect. Fasc. 118, 1911, p. 7.

North West Australia: Baudin Island (J. J. Walker).

9. **Eusphinctus (Nothosphinctus) myops** Forel.

Sphinctomyrmex emeryi var. *myops* Forel, Ann. Soc. Ent. Belg. 39, 1895, p. 421 ♀; Emery, Gen. Insect. Fasc. 118, 1911, p. 7.

S. emeryi race *clarus* var. *myops* Froggatt, Agric. Gaz. N. S. W., 1905, p. 15.

Queensland: Mackay (Gilbert Turner).

Forel does not state whether he regards the type as a normal or a gynæcoid worker. It may be the female of *emeryi*, or of an allied form, but if it is a normal worker, it should rank as a distinct species, since *emeryi* is eyeless. His brief description runs as follows: "Sculpture that of the type [*emeryi*]. Form and pilosity those of the race *clarus*. Color intermediate. Distinct from the two forms in possessing very small but distinct, flattened eyes situated at the middle of the sides of the head and comprising some thirty facets."

10. **Eusphinctus (Nothosphinctus) clarus** Forel.

Cerapachys emeryi var. *clarus* Forel, Ann. Soc. Ent. Belg. 37, 1893, p. 462, ♀.

Cerapachys clarus Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 72, ♀.

Sphinctomyrmex emeryi race *clarus* Forel, Rev. Suisse Zool. 10, 1902, p. 537; Froggatt, Agric. Gaz. N. S. W., 1905, p. 15.

Sphinctomyrmex clarus Emery, Gen. Insect. Fasc. 118, 1911, p. 7.

North West Australia: Adelaide River (J. J. Walker).

11. **Eusphinctus (Nothosphinctus) imbecillis** Forel.

Sphinctomyrmex froggatti subsp. *imbecillis* Forel, Fauna S. W. Austr. 1, 1907, p. 272, ♀, erg. ♀; Emery, Gen. Insect. Fasc. 118, 1911, p. 7.

South West Australia: Lion Mill.

I believe this form must be regarded as a distinct species as the characters in which it differs from *clarus*, are, according to Forel's statement, more than subspecific. The mandibles are not striated as in *froggatti* and are less geniculate at their bases, the anterior corners of the pronotum are more rounded, the thorax longer, the epinotum not marginate above, the petiole hardly broader than long, with shorter ventral tooth and the puncturation is feebler and sparser than in *froggatti*.

The "ergatomorphic female," described by Forel, is eyeless, with swollen epinotum, shorter and more rounded head, the petiole $1\frac{1}{3}$ times as broad as long, more voluminous gaster, emarginate pygidium, and the surface is more opaque, more punctate and more pubescent than in the worker. This singular individual measured 6.5 mm. It was found in the same vial with a number of workers and undoubtedly belonged to the same species. Forel believes that such individuals must represent the type from which the dichthadiiform females of the Dorylinæ have developed.

12. **Eusphinctus (Nothosphinctus) manni** sp. nov.

(Fig. 6.)

Worker. Length 3-5 mm.

Head distinctly longer than broad, a little broader in front than behind, with evenly rounded sides, feebly and broadly concave occipital border and short, blunt posterior corners. Eyes and ocelli absent. Occipital border marginate, the margination surrounding the posterior corners. Carinæ of cheeks very feebly developed. Mandibles not geniculate nor abruptly curved at the base, their apical borders finely denticulate. Frontal carinæ short, erect, surrounding the antennal insertions in front, truncated and fused behind in a depression uniting the antennal foveæ. Antennæ rather slender; scapes less than half as long as the head, thick at the apex, rather suddenly narrowed at the basal fourth; funicular joints 2-9 much broader than long, tenth joint as long as broad, terminal joint rather slender, fully as long as the three preceding joints together. Thorax fully $2\frac{1}{2}$ times as long as broad, distinctly narrowed in the mesonotal region, flattened above, submarginate on the sides; pronotum with rectangular humeri, vertically truncated and submarginate in front, the mesoëpinotal suture indicated by a feeble impression; epinotal

declivity steep, slightly concave, its sides sharply, its upper border feebly but distinctly marginate. Petiole subcuboidal, narrower than the epinotum, slightly broader than long, distinctly broader behind than in front, its anterior surface truncated and flat, marginate on the sides and submarginate above, its ventral surface in front with a large, blunt, compressed, translucent tooth. Postpetiole broader than the petiole, about $\frac{1}{3}$ broader than long and broader behind than in front, its anterior and lateral borders straight, its anterior corners rounded,

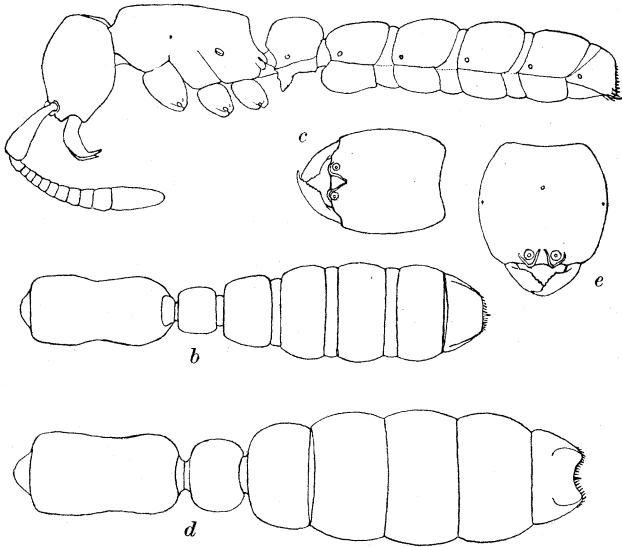


FIGURE 6. *a*, *Nothosphinctus manni* sp. nov. Worker, lateral view; *b*, thorax and abdomen of same, dorsal view; *c*, head of same; *d*, thorax and abdomen of female; *e*, head of same.

its posterior border feebly concave in the middle. Gastric segments 1-3 twice as broad as long, separated by pronounced constrictions. Pygidium truncated behind, with blunt, entire border, scarcely submarginate on the sides, the posterior border densely spinulate. Legs moderately long.

Shining; mandibles subopaque, coarsely punctate, body finely and unevenly punctate, the punctures denser on the head and legs, not larger on the thorax than on the gaster.

Hairs short, yellow, appressed or subappressed, longest on the gaster,

especially at its tip. Tibiæ and gaster with a few suberect, delicate hairs.

Uniformly brownish yellow; mandibles, frontal carinæ and incisures of antennal joints fuscous.

Female. Length 7 mm.

Very similar to the worker but besides its larger size differing in the following characters: Head not longer than broad, with much more convex sides. Posterior ocelli absent; eyes and the anterior ocellus present but the former very small, reduced to three or four minute ommatidia. Thorax shorter and stouter, not more than twice as long as broad, pronotum and lateral borders not submarginate and margination of epinotum indistinct. Petiole as broad as the epinotum, broader in proportion to its length than in the worker, flattened above, its posterior border broadly concave in the middle, its anterior surface not submarginate. Postpetiole and gaster larger, the incisures between the segments of the latter much less pronounced than in the worker, the postpetiole flattened above, nearly twice as broad as long, as are also the three basal gastric segments. Pygidium broadly and rather deeply excised behind, its posterior surface truncated, with almost submarginate sides, the posterior excision beset with minute spinules. Sting short and stout.

Sculpture like that of the worker, the surface being quite as shining; the thorax and abdomen with fine punctures and in addition with large, scattered, shallow foveolæ.

Hairs much more abundant than in the worker, erect and bristly, conspicuous also on the appendages. Pubescence abundant and rather dense, especially on the head and gaster.

Color like that of the worker, but the mandibles are ferruginous red with their apical and basal borders black. Sting black.

Described from numerous workers and a single female taken from the same colony in December 1916 at Leura in the Blue Mts. of New South Wales by Dr. W. M. Mann.

This form is very close to *imbecillis* Forel, but the female and largest workers are larger and the former possesses small eyes and has a shining body like the worker, the pronotum has more pronounced corners, the epinotal declivity of the worker is distinctly marginate above, the petiole is broader, and both the large and small workers have the same pale coloration. Additional material may show that *manni* is to be regarded as a subspecies of *imbecillis*.

13. **Eusphinctus (Nothosphinctus) mjöbergi** Forel.

Sphinctomyrmex clarus subsp. *mjöbergi* Forel, Ark. f. Zool. 9, 1915, p. 16, ♀.

Queensland: Mt. Tambourine (E. Mjöberg).

This form, too, I believe, should be regarded as a distinct species, as the differences which, according to Forel, separate it from *clarus* and *emeryi* are considerable. It is much larger (5.2–5.3 mm.) than *clarus*, much stouter and of a much darker color, and the antennæ are very different, the scapes being longer and more gradually thickened towards their tips, funicular joints 2–6 are much more transverse and the terminal joint is shorter. The thorax and petiole are more convex than in *emeryi* and the petiole is not concave in front nor marginate above, the postpetiole is longer, the first gastric segment much broader, the gastric constrictions are less pronounced, the puncturation of the body is sparser, the pubescence more dilute and the color paler, brownish red.

Genus **Phyracaces** Emery.*Table for the Identification of the Workers.*

1. Body entirely or partly red.....2.
 Body black, at most with cheeks, front, pygidium and appendages red.....13.
2. Large species, measuring 9 mm.; petiole narrowed and bilobed behind.....*heros* sp. nov.
 Smaller species, not exceeding 7 mm.; petiole rectangular, toothed at posterior corners.....3.
3. Black, with red gaster.....*ficcosus* sp. nov.
 At least the head red.....4.
4. Abdomen black or dark brown.....5.
 Body red throughout.....6.
5. Head and thorax red. Length 6–6.2 mm.
 singularis Forel subsp. *rotula* Forel.
 Thorax more or less blackened. Length 3–3.5 mm.
 elegans sp. nov.
6. Head, thorax and pedicel subopaque. Length 3.6–4 mm.
 scrutator sp. nov.
- Body shining.....7.

7. Postorbital carinae present.....8.
Postorbital carinae absent.....10.
8. Epinotal declivity longitudinally rugose.....*jovis* Forel.
Epinotal declivity smooth.....9.
9. Head feebly excised behind. Length 7 mm...*singularis* Forel.
Head deeply excised behind. Length 6 mm....*mjöbergi* Forel.
10. Length 6-7 mm.....11.
Length not exceeding 5 mm.....12.
11. Eyes at middle of head; antennal scapes separated only by their
own width from occipital border.....*sjöstedti* Forel.
Eyes a little behind the middle of the head; scapes reaching
only to middle of eyes.....*emeryi* Viehmeyer.
12. Thorax distinctly narrowed in middle; body very shining.
Length 5 mm.....*leæ* sp. nov.
Thorax scarcely narrowed in middle, body more sharply sha-
greened and less shining. Length 3.8-4.2 mm.
fervidus sp. nov.
13. Petiole, postpetiole and gaster with conspicuous appressed hairs
besides the suberect hairs.....*senescens* sp. nov.
Petiole, postpetiole and gaster with suberect hairs only....14.
14. Postpetiole scarcely larger than the petiole, as long as broad.
binodis Forel.
Postpetiole larger than the petiole.....15.
15. Eyes large, as long as distance between them and anterior
border of head.....*adami* Forel.
Eyes distinctly smaller.....16.
16. Cheeks red; funicular joints 2-9 broader than long.
larvatus sp. nov.
Cheeks black; funicular joints 2-9 as broad as long.
turneri Forel.

14. **Phyracaces heros** sp. nov.

(Fig. 7.)

Worker. Length 9 mm.

Head distinctly longer than broad and distinctly narrower in front than behind, with rather deeply and angularly excised posterior border, acute inferoposterior corners and rather large, convex eyes at the middle of the sides. Ocelli present, but small. Mandibles triangular, strongly deflected, with distinct apical and basal borders meeting at a rounded angle, the former finely denticulate, the external

borders nearly straight. Clypeus very short, vertical, fused with the front. Frontal carinae large, erect, rounded, truncated and confluent behind. Frontal groove short but distinct. Carina of cheeks bluntly dentate in front, curving inward behind and ending half way between the eye and antennal insertion. Posterior border of head marginate, the margination at the posteroinferior corner sending a horizontal carina forward nearly to the eye and another ridge downward and forward along the lateral surface of the gula half way to the anterior border of the head. Antennae rather long and slender; scapes more than half as long as the head, slender at the base, gradually enlarging towards their tips; first funicular joint a little longer than broad, second twice and third nearly twice as long as broad; remaining joints $1\frac{1}{2}$ times as long as broad, except the last which is slender and pointed, twice as long as broad and not longer

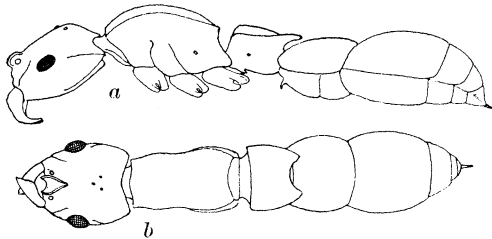


FIGURE 7. *Phyracaces heros* sp. nov. Worker; a, lateral view of body; b, dorsal view.

than the two preceding joints together. Thorax through the pronotum narrower than the head and the epinotum, narrowed in the mesonotal region, in profile evenly rounded and rather convex above to the epinotal declivity which is straight and sloping. Pleurae concave. Anterior border, sides of thoracic dorsum and of epinotal declivity strongly marginate. Boundary between base and declivity of epinotum feebly marginate; corners of epinotum bluntly dentate. Petiole a little broader than the epinotum, a little broader than long, decidedly narrower behind than in front, with straight anterior and convex lateral borders, its posterior border deeply excised in the middle, with a flattened, rounded lobe at each corner. The whole border is marginate except in the middle behind. In profile the upper surface of the petiole is flattened, its anterior surface abrupt and truncate, forming a right angle with the dorsal surface and longer

than the similar posterior surface. The ventral surface bears in front a thick, backwardly directed tooth. Postpetiole broader than the petiole, convex above and on the sides, a little broader than long, with marginate sides and a small, flattened tooth on the front of the ventral surface. First gastric segment scarcely broader than the postpetiole and of a similar shape. Pygidium with a narrow, median, longitudinal impression in front, its sides indistinctly marginate and spinulose. Legs rather long and slender; claws nearly straight; hind coxæ with a large rounded, translucent lamella at the tip on the inner side.

Surface of body smooth and shining. Mandibles coarsely punctate. Sides of front punctate-rugulose. Upper surface of body with very sparse, coarse, piligerous punctures; legs with finer and more numerous punctures. Sides of pygidium finely and densely punctate.

Hairs moderately abundant, coarse, bristly, erect, grayish or yellowish in some lights, blackish in others, long on the gaster, especially at its tip, shorter and sparser on other parts of the body, quite as long, erect and abundant on the legs and antennæ as on the head, thorax and petiole. Pubescence absent.

Rich red throughout, appendages not paler.

Described from a single example taken in Queensland (Mus. South Austr.).

This handsome species is readily distinguished by its large size, the shape of the antennæ and petiole, peculiar pilosity, etc.

15. *Phyracaces singularis* Forel.

Cerapachys singularis Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 69.
♀; Froggatt, Agric. Gaz. N. S. W., 1905, p. 14.

Phyracaces singularis Emery, Gen. Insect. Fasc. 118, 1911, p. 11.
South Australia (Wroughton).

16. *Phyracaces singularis* Forel subsp. *rotula* Forel.

Cerapachys (Phyracaces) singularis Forel race *rotula* Forel, Rev. Suisse Zool., 18, 1910, p. 21, ♀.

Cerapachys singularis var. *ratula* (sic!) Froggatt, Agric. Gaz. N. S. W., 1905, p. 15.

Phyracaces singularis var. *rotula* Emery, Gen. Insect. Fasc. 118, 1911, p. 11.

New South Wales: Inverall (W. W. Froggatt).

17. **Phyracaces emeryi** Viehmeyer.

Viehmeyer, Arch. f. Naturg. 79, 1913, p. 26, ♀.
South Australia: Killalpaninna.

18. **Phyracaces mjöbergi** Forel.

Cerapachys (Phyracaces) mjöbergi Forel, Ark. f. Zool. 9, 1915, p. 18,
Pl. 1, Fig. 9, ♀.
North West Australia: Derby (E. Mjöberg).

19. **Phyracaces sjöstedti** Forel.

Cerapachys (Phyracaces) sjöstedti Forel, Ark. f. Zool. 9, 1915, p. 19,
Pl. 1, Fig. 6, ♀.
North West Australia (E. Mjöberg).

20. **Phyracaces jovis** Forel.

Cerapachys (Phyracaces) jovis Forel, Ark. f. Zool. 9, 1915, p. 20,
Pl. 1, Fig. 1, ♀.
Queensland: Alice River (E. Mjöberg).

21. **Phyracaces leæ** sp. nov.

(Fig. 8.)

Worker. Length 5 mm.

Head longer than broad, slightly narrower in front than behind, with truncated occipital surface, deeply and angularly excised posterior border and acute inferoposterior angles. Eyes rather large, moderately convex, just in front of the middle of the sides. Carinæ of cheeks forming acute angles in front, extending back to the anterior orbits and sending a branch inward to the antennal fossa. Post-ocular carina absent. Occipital border of head marginate, the margin surrounding the inferoposterior corners and extending forward as a pair of gular carinæ to the level of the middle of the eyes. Mandibles moderately large, triangular, deflected, their external borders concave, their apical borders without denticles. Frontal carinæ approximated, rounded, erect, not truncated behind where they fuse

and join the short frontal furrow. Clypeus very short, vertical, with straight anterior border. Antennæ moderately thick; scapes a little more than half as long as the head, gradually incrassated towards their tips; first funicular joint nearly as long as broad, joints 2-9 broader than long, tenth joint as long as broad, terminal joint not longer than the two preceding joints together. Thorax rather robust, twice as long as broad, a little broader through the epinotum than through the pronotum, distinctly narrowed in the mesonotal region. Anterior border of pronotum not marginate; sides of dorsum, boundary between the epinotal base and declivity and the sides of the latter strongly marginate. In profile the dorsum is feebly convex, the epinotal declivity straight, with a small tooth above on each side. Petiole rectangular, a little broader than long, its sides straight, strongly marginate, produced behind as a pair of flat, acute teeth, its anterior border broadly concave, its anterior corners slightly rounded; in

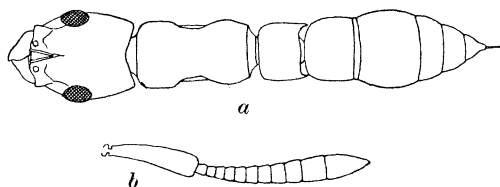


FIGURE 8. *Phyracaces leæ* sp. nov. Worker, *a*, dorsal view of body; *b*, antenna of same.

profile the dorsal surface is rather convex, its ventral surface without a tooth. Postpetiole rectangular, slightly broader than the petiole and slightly broader than long, its rounded anterior angles alone marginate. First gastric segment distinctly broader than the postpetiole, broader than long. Pygidium broadly concave above, its sides marginate and finely spinulate. Legs rather long; hind coxæ with a large, rounded, translucent lamella at the tip on the inner side.

Smooth and shining, the head and thorax very finely and superficially shagreened; mandibles more coarsely shagreened and sparsely punctate. Occipital region and upper surface of thorax and abdomen with scattered, shallow, piligerous foveolæ.

Hairs pale yellow, suberect, short, sparse and rather bristly, sparsely on the head, scapes and legs. Pubescence pale, dilute, distinct only on the legs.

Rich red throughout, antennal scapes paler, apical margins of mandibles and marginations of the head, thorax and petiole blackish.

Described from a single example taken by Mr. F. P. Dodd at Townsville, Queensland (Museum of South Australia).

This beautiful species, which is dedicated to Mr. A. M. Lea, resembles *Ph. fervidus*, but is distinctly larger, even more shining and has a differently shaped thorax.

22. ***Phyracaces fervidus* sp. nov.**

(Fig. 9.)

Worker. Length 3.8–4.2 mm.

Head longer than broad, distinctly broader behind than in front, with truncated occipital region and rather large, moderately convex eyes, situated at the anterior $\frac{2}{5}$ of the sides. Mandibles rather large, triangular, deflected, with concave external and edentate apical borders. Clypeus very short, vertical, broadly rounded in front;

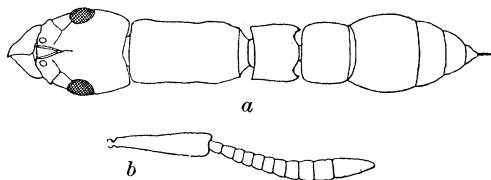


FIGURE 9. *Phyracaces fervidus* sp. nov. Worker, *a*, dorsal view of body; *c*, antenna of same.

frontal carinae approximated, not truncate behind where they unite and join the short frontal furrow. Carina of cheeks very prominent, forming a projecting tooth and dividing behind to form two ridges, one of which runs to the anterior orbit, the other to the antennal fovea. Postocular carina absent. Occipital border of head deeply and subangularly excised and marginate, the margination surrounding the rather acute inferoposterior corners and extending forward on the sides of the gula to the level of the middle of the eyes. Antennae rather slender; scapes about half as long as the head, gradually incrassated towards their tips, first and second funicular joints as long as broad; joints 3–9 distinctly broader than long; tenth joint as long as broad, terminal joint nearly as long as the three preceding joints together. Thorax rather robust; twice as long as broad, as broad in

front as behind, very feebly narrowed in the mesonotal region. Anterior border, sides and boundary between base and declivity of epinotum sharply marginate, as are also the prosterna and the sides of the epinotal declivity. In profile the thoracic dorsum is feebly and evenly convex, the declivity abrupt and nearly straight, the mesopleuræ slightly concave. Petiole a little narrower than the epinotum, rectangular, broader than long, not broader behind than in front, its anterior border broadly excised, submarginate, the sides rather straight, strongly marginate and terminating behind in a pair of flat, pointed teeth. In profile the dorsal surface is feebly convex, as are also the truncated anterior and posterior surfaces; lower surface in front with a small, acute backwardly directed tooth. Postpetiole rectangular, a little broader than the petiole and slightly broader than long, the anterior border and anterior corners scarcely submarginate. First gastric segment decidedly broader than the postpetiole, broader than long, with broadly concave anterior border and convex sides. Pygidium broadly concave above, marginate and very finely spinulate on the sides. Legs rather long, hind coxæ with a large, rounded, translucent lamella at the tip on the inner side.

Shining; finely but distinctly shagreened, the head, thorax, petiole and postpetiole more sharply so that these parts are a little less shining than the gaster. Mandibles sparsely punctate, the occiput, dorsum of thorax and abdomen with sparse, shallow, piligerous foveolæ.

Hairs yellow, suberect, delicate, moderately long and abundant on the upper surface of the thorax and abdomen, sparser on the head, very sparse on the legs and scapes. Pubescence long and conspicuous on the legs, especially on the tibiæ and on the ventral surface of the petiole.

Uniformly red, of the tint of *Polyergus rufescens*, apical borders of mandibles and carinæ of head, thorax and petiole of a deeper color, almost blackish.

Described from 19 specimens taken Oct. 18, 1914 at Cairns, Queensland, foraging on a sandy spot in the forest.

This species resembles *Ph. scrutator* but differs in being slightly larger, with more robust thorax and in having the head, thorax, petiole and postpetiole shining, the pilosity more delicate and the pubescence much longer and more abundant on the legs.

23. **Phyracaces scrutator** sp. nov.

(Fig. 10.)

Worker. Length 3.6–4 mm.

Head decidedly longer than broad, slightly narrower in front than behind, with feebly rounded sides, deeply and angularly excised occipital border and truncated occipital surface, with the inferoposterior angles sharp when seen from behind. Eyes large and rather convex, slightly in front of the middle. Ocelli absent. Mandibles rather large and broad, triangular, deflected, their external borders feebly concave, their apical borders straight, without denticles. Clypeus short, vertical, its anterior border rounded and entire. Frontal carinae erect, rounded, not truncated posteriorly but gradually continued back into the short frontal furrow. Carina of cheeks

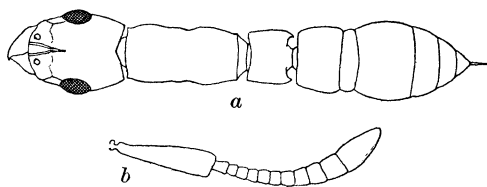


FIGURE 10. *Phyracaces scrutator* sp. nov. Worker, *a*, dorsal view of body, *b*, antenna of same.

short, prominent, but scarcely tooth-like, sending a branch backward to the anterior orbit and one inward to the antennal fovea. Occipital border of head sharply marginate, the margination surrounding the inferoposterior corners of the head and running forward on each side of the gula to a level with the posterior orbits. Postocular carina absent. Antennae moderately long; scapes nearly $\frac{3}{5}$ as long as the head, incrassated at their tips; first funicular joint longer than broad; joints 2–9 a little broader than long, tenth joint as long as broad, terminal joint but slightly longer than the two preceding joints together. Thorax rather narrow, from above more than twice as long as broad, as broad through the pronotum as through the epinotum, feebly narrowed in the mesonotal region, sharply marginate in front, on the sides, between the base and declivity of the epinotum, along the lateral borders of the declivity and the prosterna. In profile the dorsal surface is rather flat, the epinotal declivity abrupt and slightly

concave, the posterior corners of the epinotum minutely and indistinctly dentate and the mesopleuræ are concave. Petiole slightly broader than the epinotum, rectangular, scarcely broader behind than in front and somewhat broader than long, its anterior border broadly concave, the lateral borders straight, the anterior corners rectangular, the posterior produced as acute, flattened teeth. The anterior and lateral borders are sharply marginate. In profile the dorsal surface is feebly convex, the anterior surface truncate and concave, the ventral surface in front with a swelling but without a tooth. Postpetiole somewhat broader than the petiole, a little broader than long and broader behind than in front, its sides feebly convex; these and the anterior border not marginate. First gastric segment broader than the petiole and broader than long. Pygidium very feebly concave above, marginate and minutely spinulose on the sides. Legs moderately long; hind coxæ with a large, rounded, translucent lamella at the tip on the inner side.

Subopaque, or lustrous; mandibles, clypeus and gaster more shining. Mandibles shagreened and very sparsely and coarsely punctate. Head, thorax, petiole and postpetiole very densely and finely reticulate, posterior portion of head and dorsal surface of thorax, petiole and postpetiole also with shallow, evenly but very sparsely distributed, piligerous foveolæ. Gaster, scapes and legs more superficially reticulate than the thorax, the gaster also with scattered, coarse, piligerous punctures.

Hairs yellow, rather coarse and long, subappressed, very sparse on the upper surface of the head, more abundant on the dorsum of the rest of the body, absent on the scapes and legs which have only a long, dilute, yellowish pubescence.

Rich red throughout, of the tint of *Polyergus rufescens*, with only the apical border of the mandibles, the edges of the frontal carinæ and the marginations of the thorax and petiole of a deeper tint.

Described from several specimens taken Nov. 10, 1914 at Toowong, near Brisbane, Queensland. They were running about rapidly under a stone, evidently in search of the brood of other ants.

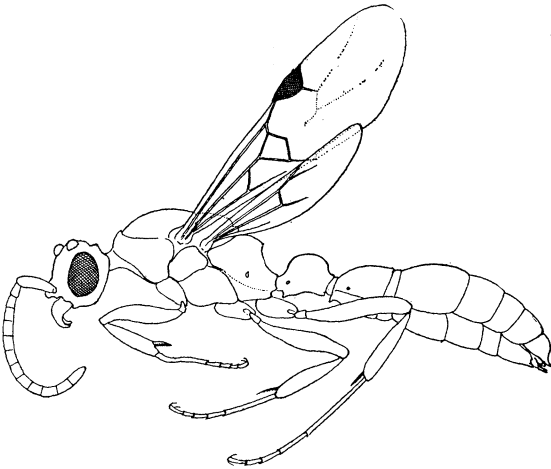
This species is easily distinguished from all the other red species of *Phyracaces* by the subopaque, finely reticulate surface of the head, thorax, petiole and postpetiole.

24. ***Phyracaces rugulinodis*** sp. nov.

(Fig. 11.)

Male. Length 5 mm.

Head, including the eyes, broader than long, broadly convex and rounded behind, cheeks very short, eyes and ocelli very large and convex. Mandibles large, triangular, deflected, with concave external and very finely and indistinctly denticulate apical borders. Occipital border strongly marginate, continued below into two gular marginations which run forward to a level with the anterior orbits. Clypeus very short, with straight anterior border; frontal area repre-

FIGURE 11. *Phyracaces rugulinodis* sp. nov. Male, lateral view.

sented by a deep pit; frontal carinae subparallel, straight, half as long as the head. Antennae 13-jointed, scapes reaching to the posterior orbit, cylindrical, not thickened at their tips; funiculus of uniform diameter throughout, all the joints longer than broad, cylindrical. Thorax narrower than the head through the eyes, pronotum swollen in the middle and on the sides; mesonotum rather regularly hexagonal, feebly convex, without Mayrian furrows. Epinotum with distinct base and declivity, the former feebly convex and sloping, the latter nearly vertical and concave, strongly marginate above and

on the sides. Petiole from above subrectangular, a little longer than broad, as broad in front as behind, with straight anterior and posterior borders and evenly rounded sides; in profile the dorsal surface is strongly convex, the anterior and posterior surfaces short and slightly concave, the former strongly marginate above and on the sides, the ventral surface with a small, sharp tooth at the anterior end. Postpetiole decidedly broader than the petiole, as long as broad, broader behind than in front, with convex sides and dorsum, with a small acute tooth at its anterior border on the ventral side. Gaster rather slender. Pygidium evenly and broadly rounded at the tip. Cerci absent. Genital appendages blunt, retracted. Hypopygium with broad posterior border, feebly and narrowly emarginate in the middle. Legs slender, hind coxæ without lamellate tips. Wings short, with large, thick pterostigma. There is a well-developed discal cell but the veins distal to it are so nearly obsolete that those outlining a closed marginal and single cubital cell are scarcely visible as very delicate folds in the wing membrane.

Mandibles and space between the frontal carinæ shining; mandibles coarsely and sparsely punctate; remainder of head opaque, finely and densely punctate, with very uneven surface. Sides of pronotum, the mesonotum and mesopleuræ smooth and shining, the mesonotum with scattered, piligerous foveolæ; middle of pronotum, the whole epinotum, petiole and postpetiole subopaque, finely punctate and rugulose, the rugæ on the base and sides of the epinotum coarse, somewhat longitudinal on the base near the margination separating it from the declivity; the latter finely and densely punctate. Gaster shagreened, coarsely on the base of the first segment, finely elsewhere so that the surface is shining.

Hairs yellow, bristly, suberect, pointed, scattered, covering the body and legs rather uniformly, present only on the anterior surfaces of the scapes. Pubescence yellowish, distinct only on the scapes.

Red; ocellar region, middle portions of tibiæ and femora, middle of pronotum and anterodorsal portions of petiole and first gastric segment brown. Wings whitish hyaline, with yellow veins and very conspicuous dark brown pterostigma.

Described from a single specimen from Murat Bay, South Australia (Museum of South Australia). There is another defective specimen in the same collection from Ardrossan, South Australia (J. G. O. Tepper).

This may be the male of one of the smaller red species of *Phyracaces* described in the preceding pages.

25. **Phyracaces mullewanus** sp. nov.

Male. Length 5.4 mm.

Head, including the eyes, much broader than long, with broadly rounded posterior portion and short cheeks, truncated behind the ocelli, with strongly marginate occipital border, the margination extending forward on each side of the gula to the level of the middle of the eyes. Eyes and ocelli large and prominent. Mandibles triangular, acutely pointed, rather narrow, with oblique, finely and evenly denticulate apical and concave external borders. Clypeus short, with straight, entire anterior border. Frontal carinae rather far apart, parallel in front, approximated behind, half as long as the distance between the anterior clypeal border and the posterior ocelli. Antennal scapes not reaching to the posterior orbits; all the funicular joints, except the last, a little broader than long, last joint twice as long as the preceding, pointed. Thorax robust, as broad through the wing-insertions as the head through the eyes. Pronotum not very convex; mesonotum convex above, hexagonal, narrower in front than behind. Epinotum with distinct base and declivity, the former in profile feebly convex, shorter than the vertical, concave declivity, the latter strongly marginate above and on the sides. Petiole as broad as long, cuboidal, its upper surface convex, the anterior marginate above and on the sides. Postpetiole broader than the petiole, broader than long, broader behind than in front, with convex dorsal and lateral surfaces. First gastric segment of a similar shape but broader. Pygidium and hypopygium with broadly rounded tips. Cerci absent. Genital appendages retracted. Legs slender and rather short; hind coxae without lamellate tips. Wings short, venation much as in *rugulinodis*, but veins of the distal portion of the discal cell obsolete and the pterostigma smaller, though thick.

Shining; mandibles coarsely punctate, their bases, the epinotum and petiole subopaque, finely and densely punctate; base and sides of epinotum and upper surface of petiole also rugulose. Head and scutellum shagreened; surface of occipital region very uneven; mesonotum with large, coarse, deep, scattered, piligerous foveolae; postpetiole and first gastric segment with smaller and more numerous foveolae; gaster shagreened.

Hairs yellowish, sparse, erect, pointed, and coarse, moderately long, shorter on the legs. Pubescence absent, except on the antennal funiculi.

Rich red; mesonotum with three brown blotches. Wings whitish hyaline, veins pale yellow, pterostigma dark brown, very conspicuous.

Described from a single specimen taken by Miss F. May at Mullewa, West Australia (Museum of South Australia).

This species is readily distinguished from *rugulinodis* by its larger size, more robust stature, smaller eyes and ocelli, shorter funicular joints, shorter petiole, more shining postpetiole, etc. It may be the hitherto unknown male of *Ph. singularis* or of an allied species.

26. **Phyracaces ficosus** sp. nov.

(Fig. 12).

Worker. Length 5.5–6 mm.

Head slightly longer than broad, distinctly broader behind than in front, convex above and on the sides, with excised posterior border

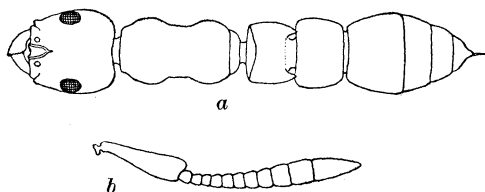


FIGURE 12. *Phyracaces ficosus* sp. nov. Worker, *a*, dorsal view of body, *b*, antenna of same.

and rather acute inferoposterior corners. Eyes rather large, feebly convex, at the middle of the sides of the head; ocelli absent. Mandibles triangular, deflected, with finely denticulate apical border passing through a rounded angle into the basal border; external border rather straight. Clypeus very short, vertical. Frontal carinae large, erect, rounded, not truncated at their confluence behind. Carina of cheeks short, with a prominent blunt tooth. Postocular carina absent. Occipital border of head strongly marginate, the margination continued forward on each side of the gula to the level of the middle of the eyes. Antennae stout; scapes a little less than half as long as the head, gradually incrassated towards their tips; none of the funicular joints, except the ultimate and penultimate, longer than broad, the ultimate tapering and pointed, not longer

than the two preceding together. Thorax as broad through the pronotum as through the epinotum, distinctly narrowed in the middle, the dorsum feebly convex, the mesopleuræ rather concave, the epinotal declivity nearly vertical, feebly concave. The anterior border of the pronotum, the sides of the dorsum, the boundary between the epinotal base and declivity, the sides of the latter and the prosterna sharply marginate. Petiole as broad as the epinotum, nearly $1\frac{3}{4}$ times as broad as long, as broad behind as in front, with feebly and evenly rounded sides, concave anterior border and the posterior corners projecting as flattened, rather acute teeth. Only the anterior and lateral borders are marginate. In profile the dorsal surface is feebly convex, the anterior surface vertical and joining it at a right angle, the ventral surface with a strong, pointed tooth at the anterior end. Postpetiole broader than long, broader than the petiole and distinctly broader in front than behind, with distinctly rounded anterior, lateral and posterior borders, the lateral borders marginate. First gastric segment a little broader than long and a little broader than the postpetiole, distinctly broader behind than in front. Pygidium with a large concave depression on its dorsal side, marginate and minutely spinulose on the sides. Legs moderately stout; coxæ of hind pair with a small, translucent lamella at the tip on the inner side.

Smooth and shining; mandibles coarsely and sparsely punctate. Dorsal surface of body with small, scattered, piligerous punctures.

Hairs grayish yellow, erect, rather long, slender, pointed and sparse, not appreciably longer and denser on the gaster than on the remainder of the body, shorter and somewhat more oblique on the scapes and legs. Legs, coxæ and scapes with rather long, appressed, grayish pubescence.

Black; gaster, except the extreme base of the first segment rich, cherry red. Mandibles, except their bases and borders, insertions and terminal joints of antennæ, tarsi and articulations of legs and the space between the frontal carinæ, reddish brown.

Described from a dozen specimens taken Dec. 4, 1914 in the Bulli Pass, New South Wales. They were running over the sand in a loose file, carrying the nude pupæ of a Myrmicine ant whose nest they had just plundered.

This beautiful species is easily distinguished by its peculiar color and the shape of its petiole.

27. *Phyracaces elegans* sp. nov.

(Fig. 13.)

Worker. Length 3-3.5 mm.

Head longer than broad, broader behind than in front, convex above, with truncated occipital region and gula, blunt posterior corners and excised posterior border. Eyes rather large, flat, distinctly in front of the middle of the sides; ocelli absent. Carina of cheeks forming a blunt, rectangular tooth. Postocular carina absent. Posterior border of head marginate, the margination surrounding the infero-posterior corners and extending forward on each side of the gula about $\frac{1}{3}$ the length of the head. Mandibles triangular, deflected, with finely denticulate apical and rather convex external borders. Frontal carinae moderately large, erect, rounded, confluent but not truncated behind. Antennae rather robust; scapes half as long as

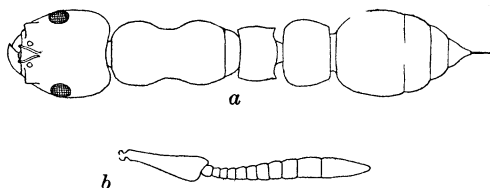


FIGURE 13. *Phyracaces elegans* sp. nov. Worker, a, dorsal view of body, b, antenna of same.

the head, gradually thickened towards their tips; funicular joints 1-9 distinctly broader than long, tenth joint longer than broad, terminal joint tapering and pointed, a little longer than the two preceding joints together. Thorax narrower than the head, as broad through the pronotum as through the epinotum, narrowed in the mesonotal region; in profile rather flat above, with straight, abrupt epinotal declivity. All four sides of the dorsum, the prosterna and sides of the epinotal declivity are distinctly marginate, and the epinotum bears a pair of small acute teeth. Petiole rectangular, somewhat broader than long, as broad as the epinotum, its anterior border slightly concave, the lateral borders marginate, with small acute, dentiform posterior corners. In profile the petiole is flat above and concave on the sides, the anterior surface is abrupt and forms somewhat less than a right angle with the dorsal surface, the

ventral surface with a blunt, compressed tooth in front. Postpetiole a little broader than the petiole, subrectangular, scarcely broader behind than in front, convex above and on the sides, the latter sharply marginate. First gastric segment broader than long and broader than the postpetiole, a little broader behind than in front. Pygidium feebly concave above, marginate and minutely spinulose on the sides. Legs moderately stout; coxæ of the hind pair with a large, rounded, translucent lamella at the tip on the inner side.

Smooth and shining; mandibles coarsely and sparsely punctate. Upper surface of body with very sparse piligerous punctures, which are large on the vertex of the head and the middle of the postpetiole.

Hairs yellowish, sparse, rather long, slender, erect, shorter and more oblique on the appendages. Sides of petiole, coxæ, legs and antennal scapes with conspicuous grayish pubescence.

Reddish yellow; postpetiole and gaster, except the tip, black or very dark brown; pronotum and often also the sides of the mesonotum and sides and posterior portions of the base of the epinotum castaneous or reddish brown; mandibles, antennæ, legs and tip of gaster reddish brown, varying in depth of hue in different specimens.

Female. Length 4.5 mm.

Resembling the worker, but with larger eyes, ocelli and a different thorax. The latter is narrower than the head and like the thorax of the worker in shape, but with distinct pronotal, mesonotal, scutellar, metanotal, parapteral, sternal and mesepimeral sclerites, though there are no traces of wing stumps. The mesonotum is very small and flat, suborbicular, scarcely longer than broad. The gaster is much larger than in the worker, fully twice as long as broad.

Sculpture, pilosity and color much as in the worker, ocellar region with a brown cloud.

Described from forty workers and a single female, forming the greater portion of a single colony taken Sept. 16, 1914 near Southernland, a short distance from Sydney, New South Wales. The ants were bunched together under a large piece of sandstone in a thin layer of earth which in turn was lying on the sandstone wall of a deep ravine. There were no larvæ, and as the preceding night had been very rainy, I infer that the colony had been washed out of its nest and had taken refuge in the place in which it was found. Two workers taken by Mr. E. H. Zeck at Berowra, N. S. W., and belonging to Dr. W. M. Mann, are also referable to this species, which differs from all the preceding members of the genus in its peculiar color and small size.

28. *Phyracaces turneri* Forel.

(Fig. 14.)

Cerapachys (Phyracaces) turneri Forel, Rev. Suisse Zool. 10, 1902, p. 405, ♀ ♀; Ark. f. Zool. 9, 1915, p. 18, ♀.

Cerapachys turneri Froggatt, Agric. Gaz. N. S. W., 1905, p. 15.

Phyracaces turneri Emery, Gen. Insect. Fasc. 118, 1911, p. 11.

Worker. Length 3.5–4 mm.

Head longer than broad, a little narrower in front than behind, truncated and slightly constricted in the occipital region, convex above, with acute inferoposterior corners, rather deeply excised occipital border and moderately large, convex eyes, placed near the middle of the sides. Ocelli absent. Carina of the cheeks with a prominent tooth or angle. Postocular carina absent; occipital bor-

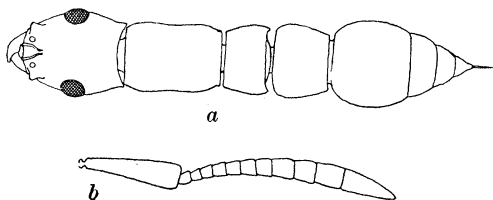


FIGURE 14. *Phyracaces turneri* Forel. Worker, *a*, dorsal view of body, *b*, antenna of same.

der of head strongly marginate, the margination surrounding the posterior angles and running forward on each side of the gula to a level with the posterior orbits. Clypeus short and vertical. Frontal carinae erect, rounded, abruptly truncated behind where they are very close together. Antennae rather robust; scapes longer than half the head, rapidly enlarging towards their tips; funicular joints 1–9 as long as broad, tenth joint longer than broad, terminal joint tapering, pointed, a little longer than the two preceding joints together. Thorax rectangular, scarcely more than $1\frac{1}{2}$ times as long as broad, robust, scarcely narrowed in the middle, evenly convex above in profile, with straight, vertical epinotal declivity; anterior and lateral borders, boundary between the epinotal base and declivity and sides of the latter sharply marginate, anterior pronotal angles and corners of epinotum acutely dentate. Petiole a little broader than the epinotum, rectangular, broader than long, a little broader behind than in front,

its posterior angles produced as small, flattened teeth, its sides, anterior and posterior borders marginate. In profile it is feebly convex above, concave on the sides, with abrupt, vertical anterior surface, joining the dorsal surface at a right angle, and the ventral surface with a blunt tooth at the anterior end. Postpetiole rectangular, a little broader than long, and a little broader than the petiole, slightly broader in front than behind, with straight sides, anterior and posterior borders and rounded, flattened anterior angles. The anterior and lateral borders are strongly marginate. First gastric segment a little broader than the postpetiole, with convex dorsum and sides. Pygidium bluntly pointed at the tip, concave above, marginate and minutely spinulose on the sides. Legs rather long; hind coxæ with a large, rounded, translucent lamella at the tip on the inner side.

Smooth and shining; mandibles coarsely punctate; head and body above with sparse, piligerous punctures, which are large and conspicuous on the vertex. Sides of pygidium and posterior borders of gastric segments densely and finely punctate. Scapes and legs with numerous, minute, piligerous punctures.

Hairs grayish yellow, erect, pointed, sparse, long and rather uniformly distributed on the body, shorter and more oblique on the appendages. Legs and scapes with distinct grayish pubescence.

Black; mandibles, pygidium, sting, antennæ and legs brownish red.

Female (deålated). Length 4.1 mm.

Like the worker except for the ocelli and thoracic sclerites. Mesonotum and scutellum very small and flat. Stumps of wings distinct.

Queensland: Mackay, type locality (Gilbert Turner); Cedar Creek (E. Mjöberg); Kuranda (Wheeler).

I have redescribed the worker from nine specimens which I found running over dead leaves in the dark tropical "scrub" near Kuranda. The description of the female is taken from Forel. The worker of this species is readily distinguished from that of the other black species of *Phyracaces* by the longer funicular joints and the shape of the petiole and postpetiole and from all but *Ph. senescens* by its short, thickset thorax.

29. ***Phyracaces larvatus*** sp. nov.

(Fig. 15.)

Worker. Length 3-3.6 mm.

Head longer than broad, a little narrower in front than behind, with feebly convex sides, concave posterior border and short, rather blunt inferoposterior corners. Eyes large and moderately convex,

nearly as long as their distance from the anterior border, a little in front of the middle of the head. Carina of cheeks very prominent, forming a strong, rectangular tooth. Postocular carina absent. Occipital border of head marginate, the margination surrounding the inferoposterior corners and running forward on each side of the gula to the level of the posterior orbits. Mandibles triangular, deflected, with concave external and finely denticulate apical borders. Frontal carinae rather far apart, suberect, feebly emarginate but not truncate behind before they meet. Antennae rather stout; scapes a little longer than half the head, gradually incrassated towards the tip; funicular joints 1-9 distinctly broader than long, tenth joint not longer than broad, terminal joint pointed, nearly as long as the three preceding joints together. Thorax subrectangular, nearly twice as long as broad, as broad through the pronotum as through the epinotum, very feebly narrowed in the middle, in profile evenly convex above, epinotal declivity flat, very abrupt. There are marginations on the

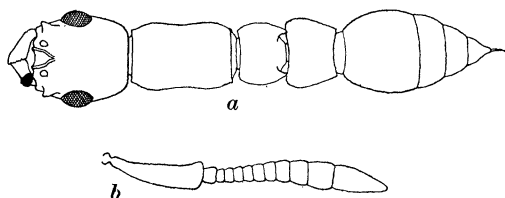


FIGURE 15. *Phyracaces larvatus* sp. nov. Worker, *a*, dorsal view of body, *b*, antenna of same.

anterior and lateral borders, between the epinotal base and declivity, along the sides of the latter and extending down the prosterna. Above the epinotum bears a pair of minute teeth. Petiole slightly narrower than the epinotum, broader than long, as broad behind as in front, with rounded sides, rather sharp, flattened, posterior teeth and concave anterior border. The anterior and lateral borders are marginate. In profile the dorsal surface is feebly convex, the anterior surface vertical and truncated, and there is a small, translucent, backwardly directed tooth on the anteroventral surface. Postpetiole decidedly broader than the petiole, a little broader than long, broader in front than behind, separated by a strong constriction from the gaster; its anterior corners are rounded and flattened, its sides straight, its anterior and posterior borders are concave, its anterior and lateral borders sharply marginate. First gastric segment broader than the

postpetiole, a little broader than long and a little broader behind than in front. Pygidium concave above, with marginate, minutely spinulose sides. Legs moderately long; hind coxæ with a large, angular, translucent lamella at the tip on the inner side.

Smooth and shining; mandibles coarsely punctate; head and thorax above with numerous piligerous foveolæ, gaster with piligerous punctures.

Hairs covering the body and appendages sparse, white, rather long, suberect and delicate. Pubescence pale, dilute, distinct only on the appendages.

Black; mandibles, cheeks, front, clypeus, legs, sting, pygidium and incisures of abdomen, dark red.

Described from numerous specimens from a single colony taken Sept. 19, 1914 from under a small stone in the bottom of one of the deep gorges at Katoomba in the Blue Mts. of New South Wales.

This species seems to be very close to *Ph. adamus* Forel, but differs in its smaller size, less rectangular petiole, somewhat smaller eyes, broader eighth and ninth funicular joints and the red front of the head.

30. *Phyracaces adamus* Forel.

Cerapachys (Phyracaces) adamus Forel, Rev. Suisse Zool. 18, 1910, p. 18, ♀.

Phyracaces adamus Emery, Gen. Insect. Fasc. 118, 1911, p. 11, ♀.

Queensland: Kuranda (Rowland Turner).

The worker of this species, which I have not seen, is, according to Forel, close to *turneri*, but larger (4.2–4.8 mm.), with the eyes much more developed and the head of a different conformation.

31. *Phyracaces senescens* sp. nov.

(Fig. 16.)

Worker. Length 3.6–4 mm.

Head longer than broad, as broad in front as behind, with moderately large, flattened eyes, placed at the middle of its sides. Ocelli absent. Upper surface of head convex, occipital surface truncated, sides scarcely convex, occipital border broadly excised, marginate, the margination surrounding the rather acute inferoposterior corners and running forward on each side of the gular surface to the middle of the head. Postocular carina absent. Carina of cheeks well

developed, produced as a prominent angle. Mandibles triangular, deflected, with nearly straight external and finely denticulate apical borders. Clypeus short, vertical. Frontal carinae erect, not very prominent, rather small, not truncated before their confluence behind. Antennal scapes not more than half as long as the head, gradually incrassated toward their tips, funicular joints 1 and 10 slightly longer than broad, joints 2-9 distinctly broader than long, terminal joint rather swollen and scarcely tapering, a little longer than the two preceding joints together. Thorax a little more than twice as long as broad, as broad through the pronotum as through the epinotum, slightly narrowed in the mesonotal region and with concave mesopleurae. Marginations developed on the anterior and lateral borders, on the boundary between the epinotal base and declivity, along the sides of the latter and the prosterna. Upper corners of epinotum not

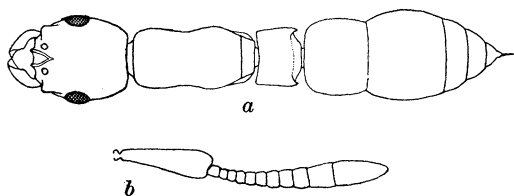


FIGURE 16. *Phyracaces senescens* sp. nov. Worker, *a*, dorsal view of body, *b*, antenna of same.

dentate. In profile the thoracic dorsum is very feebly and evenly convex, the declivity of the epinotum steep and straight. Petiole as broad as the epinotum, rectangular, broader than long, broader behind than in front, with concave anterior, straight lateral and nearly straight posterior border and its posterior angles produced as acute, slightly incurved teeth. The lateral borders are marginate, the anterior border submarginate. In profile the dorsal surface is flat and forms a right angle with the truncated, vertical anterior surface, the posterior surface is concave and slightly sloping, the ventral surface bears a pointed, triangular tooth at its anterior end. Postpetiole broader than the petiole, nearly as long as broad, not very sharply separated from the gaster, with rounded dorsal and lateral surfaces and anterior angles. First gastric segment broader than long and decidedly broader than the postpetiole. Pygidium with a shallow elliptical impression on its dorsal surface, its sides beset with

a row of minute spinules. Legs rather stout; tip of hind coxæ on the inner side produced as a rounded, translucent lamella.

Mandibles shining, coarsely punctate; head and thorax smooth and shining, above with coarse, sparse, piligerous punctures; petiole, postpetiole and gaster, except the intersegmental regions, more opaque, finely and densely punctate.

Hairs white, rather long and delicate, suberect and pointed; on the petiole, postpetiole and gaster in part appressed and more abundant, but not concealing the sculpture. Pubescence abundant and rather long, whitish, confined to the coxæ, legs and venter.

Black; mandibles, pygidium, sting, funiculi, tips of scapes, tarsi, coxæ and bases and tips of femora and tibiæ castaneous.

Described from numerous workers taken at Salisbury Court, near Uralla, New South Wales, from a single colony which was running about on a foraging expedition.

This species is easily distinguished from the other black species of *Phyracaces* by its subopaque abdomen and its long, appressed, pale hairs, which give it a grayish appearance.

32. *Phyracaces binodis* Forel.

(Fig. 17.)

Cerapachys (*Phyracaces*) *binodis* Forel, Rev. Suisse Zool. 18, 1910, p. 20, ♀.

Phyracaces binodis Emery, Gen. Insect. Fasc. 118, 1911, p. 11.

Worker. Length 3.8–4 mm.

Head longer than broad, nearly as broad in front as behind, moderately convex above and truncated in the occipital region. Eyes rather large and flat, situated a little in front of the middle of the sides. Ocelli absent. Carina of cheeks forming a prominent angle. Postocular carina absent. Occipital border of head broadly excised, strongly marginate, the margination surrounding the acute infero-posterior corners and running forward on each side of the gular surface about $\frac{1}{3}$ the length of the head. Mandibles triangular, convex, deflected, their apical borders minutely denticulate, their external borders slightly concave. Clypeus short and vertical. Frontal carinæ erect, rounded, truncated behind where they meet. Antennæ rather long; scapes about $\frac{3}{5}$ as long as the head, all the funicular joints, except the last, distinctly broader than long, last joint rather

large and swollen, longer than the two preceding joints together. Thorax subrectangular, about twice as long as broad, as broad through the pronotum as through the epinotum, distinctly narrowed in the middle, with concave mesopleuræ; anterior border straight and transverse, submarginate; prosterna, lateral borders and boundary between the epinotal base and declivity marginate, sides of the latter scarcely submarginate. Epinotum above with a pair of distinct teeth. Petiole nearly as long as broad, rectangular, marginate only on the sides, its anterior corners sharp, its posterior corners forming short, acute, flattened teeth, its anterior border feebly concave. In profile the dorsal surface is rather flat, the anterior surface very abrupt, forming less than a right angle with the dorsal surface, the posterior surface sloping, the ventral surface with an acute, translucent, backwardly directed tooth. Postpetiole of much the same shape as the

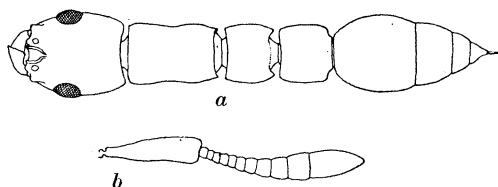


FIGURE 17. *Phyracaces binodis* Forel. Worker, a, dorsal view of body, b, antenna of same.

petiole but somewhat longer, though not broader and with the anterior corners less acute; it is very strongly constricted off from the first gastric segment and has the anterior and lateral borders marginate. First gastric segment broader than the postpetiole, longer than broad, broader behind than in front. Pygidium feebly impressed on the dorsal side, bordered with minute spinules. Legs rather slender, coxæ of hind pairs with an erect, translucent lamella at the tip on the inner side.

Smooth and shining; mandibles coarsely punctate; upper surface of body with rather evenly distributed, coarse, piligerous punctures.

Hairs delicate, whitish, rather long, pointed, erect, covering the body and appendages, somewhat shorter and more oblique on the latter. Pubescence very feebly developed, distinct only on the coxæ and antennal scapes.

Black; mandibles, antennæ, front, cheeks, legs including coxæ, pygidium and incisures of the abdomen on the ventral side reddish brown.

Queensland: Kuranda (Rowland Turner).

Redescribed from a cotype received from Prof. Forel and numerous specimens taken Oct. 3, 1914 at Kuranda from a single colony, which was nesting in a small cavity in a red-rotten log in the dark "scrub."

This form is readily distinguished by the shape of the petiole and postpetiole and the pronounced constriction between the latter and first gastric segment.

Genus **Cerapachys** F. Smith.

33. **Cerapachys (Syscia) australis** Forel.

Syscia australis Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 68, ♀; Froggatt, Agric. Gaz. N. S. W., 1905, p. 14.

Cerapachys (Syscia) australis Emery, Gen. Insect. Fasc. 118, 1911, p. 10, ♀; Crawley, Ann. Mag. Nat. Hist. (8) 15, 1915, p. 133, ♀.

Worker. Length 3–3.5 mm.

Head about $\frac{1}{2}$ longer than broad, subrectangular, as broad in front as behind, with evenly convex sides, broadly excised posterior border and short, rather pointed posterior corners. Eyes absent. Mandibles subtriangular, deflected, with distinctly dentate apical and basal borders. Clypeus extremely short. Frontal carinae approximated, erect, surrounding the antennal insertions in front, converging and truncated behind where they fuse in a depression uniting the antennal foveae. Carinae of cheeks indistinct. Antennal scapes robust, slender at their insertions, less than half as long as the head; first funicular joint as long as broad, joints 2–7 broader than long, terminal joint large, glandiform, as long as the four preceding joints together. Thorax decidedly narrower than the head, a little more than twice as long as broad, as broad behind as in front, slightly narrowed in the mesonotal region, without transverse sutures; humeri and corners of epinotum rounded; in profile the dorsal surface is straight, the epinotal declivity abrupt, marginate on the sides and submarginate above; the pronotum submarginate in front. Petiole narrower than the epinotum, rounded cuboidal, scarcely broader than long and scarcely broader behind than in front, with convex sides and a blunt, compressed tooth on its anteroventral surface. Postpetiole rising the petiole but broader, distinctly broader than long and a little broader behind than in front, with rounded anterior corners, feebly convex sides and a very protuberant anteroventral surface. First gastric segment very large, about $\frac{1}{3}$ longer than broad, much longer

than the remaining segments together, distinctly flattened dorso-ventrally and with feebly convex sides. Pygidium small, truncated, entire, its border spinulose. Legs rather long.

Shining; mandibles coarsely punctate; head, thorax, petiole and postpetiole covered with large, sparse, piligerous punctures; gaster somewhat more finely and densely punctate.

Erect hairs yellow, rather abundant, moderately long, and of uneven length, covering the body and appendages, longest on the tip of the gaster. Pubescence dilute, conspicuous only on the gaster, legs and scapes.

Yellowish red; legs, scapes and terminal antennal joint paler; mandibles, frontal carinae and anterior border of cheeks brownish.

Queensland: Mackay, type-locality (Turner); Bribie Island, near Brisbane (H. Hacker).

Northern Territory: Darwin (G. F. Hill).

Redescribed from a couple of cotypes received from Prof. Forel. Mr. Henry Tryon informs me that this ant is not uncommon in some parts of Queensland but is easily overlooked because it leads a hypogæic life.

34. *Cerapachys (Syscia) australis* var. *edentata* Forel.

Syscia australis var. *edentata* Forel, Ann. Soc. Ent. Belg. 44, 1900, p. 69, ♀.

Syscia australis var. *edentata* (sic!) Froggatt, Agric. Gaz. N. S. W., 1905, p. 14, ♀.

Cerapachys (Syscia) australis var. *edentula* (sic!) Emery, Gen. Insect. Fasc. 118, 1911, p. 10, ♀.

Queensland: Mackay, type-locality (Turner); Brisbane (H. Tryon).

This form differs from the typical *australis* in its deeper, more reddish coloration, somewhat feebler and sparser puncturation, somewhat more transverse first to seventh funicular joints and especially in lacking teeth on the apical and basal borders of the mandibles.

Genus *Lioponera* Mayr.

35. *Lioponera australis* Forel.

Lioponera longitarsis Mayr var. *australis* Forel, Ann. Soc. Ent. Belg. 39, 1895, p. 422, ♀; Froggatt, Agric. Gaz. N. S. W., 1905, p. 8; Emery, Gen. Insect. Fasc. 118, 1911, p. 12.

Queensland: Mackay (Turner).

Owing to the profound differences between the Australian ant fauna and that of India it is improbable that this form is merely a variety of *L. longitarsis* Mayr of the latter country. Forel, in his brief description calls attention to the following peculiarities of *australis*, but the study of more material will in all probability reveal others: Length 3.4 mm. It is smaller than *longitarsis* and has somewhat smaller and more convex eyes. The petiole is transversely rectangular, whereas in *longitarsis* its anterior corners are more projecting and its anterior border is distinctly concave. The sculpture of *australis* is more regularly punctate and the postpetiole is blackish brown, with two large, reddish spots.